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ABSTRACT

This volume presents selected major addresses given during the plenary sessions of the 1985 International Council on Education for Teaching (ICET) World Assembly. Papers are grouped according to World Assembly themes: Education in the Information Age; Research in Teacher Education: New Emphases in the Information Age; Current Developments in Education in the Information Age; and Collaboration of Higher Education and the Private Sector in Development. Included also are selected comments of panel members, and abstracts of concurrent session presentations. The following papers are reproduced: (1)"Overview and Major Tenets of Canadian Foreign Policy: Past, Present, and Future" (Paul Heinbecker); (2) "Canada's Role in International Development" (Robert J. Moore); (3) "The Multilateral Imperative: International Issues in Teacher Education Curriculum" (Stephen Lewis); (4) "Education in the Information Age: The Keynote Address" (Jack R. Taub); (5) "The Nature of Work and the Nature of Schooling: New Responsibilities for Teacher Education in the Information Age" (Milton McClaren); (6) "The Impact of Research on Teacher Education" (Gene Hall); (7) "Implications of the Information Age for the Teaching Profession" (Mary Moran); and (8) "Teaching in the Future: Three Scenarios" (Peter J. Murphy and Geoffrey Potter). (JD)

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ICET

EDUCATION IN THE INFORMATION AGE: THE IMPACT ON TEACHER EDUCATION AND TEACHING

INTERNATIONAL YEARBOOK ON TEACHER EDUCATION 1985

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International Council on Education for Teaching

The International Council on Education for Teaching (ICET) is an international association of educational organizations, institutions, and individuals dedicated to the improvement of teacher education and all forms of education and training related to national development.

The Council is incorporated in the United States as a non-governmental organization (NGO), and has official consultative status with UNESCO. Membership in ICET is open to individuals, colleges, universities, government agencies, and private sector organizations who are engaged in educational and training activities.

The Council is governed by a Board of Directors and is provided with professional counsel by a Board of Trustees. Directors and Trustees are representative of the geographical, social, cultural, and professional diversity of the world. ICET activities are administered by an executive office located in Washington, D.C. which facilitates the cooperative projects of its members.

ICET conducts an annual World Assembly as a forum for the worldwide educational community on matters related to national development and teacher education, and publishes an annual volume of proceedings. ICET also provides technical assistance to educational systems and administers a management training program which provides educational leaders with internships in colleges, universities, private sector organizations, and government agencies.

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EDUCATION IN THE INFORMATION AGE: THE IMPACT ON TEACHER EDUCATION AND TEACHING

INTERNATIONAL YEARBOOK ON TEACHER EDUCATION 1985

Selected Papers
from
The Thirty-Second World Assembly
Vancouver, British Columbia, Canada
July 22-26, 1985

Editor: Joost Yff
Associate Executive Director, ICET

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Appreciation is expressed also to the many World Assembly sponsors, in all some 29 agencies, organizations, institutions and private sector firms, who supported the Assembly in various ways. These sponsors are identified in the list appearing on page 162.

Certain other organizations were instrumental in disseminating information about the Assembly, thereby encouraging wide participation. These organizations are: The Alberta Teachers' Association; The Canadian Education Association; The Saskatchewan Teachers' Federation; The Manitoba Teachers' Society; and a number of the Assembly sponsors mentioned earlier.

Finally, special thanks are extended to Robert and Heather Taylor, Dave Ellis, Phil Moir, and Kathleen Forsythe for their unflagging personal assistance prior to and during the Assembly.

Frank H. Klassen
Executive Director

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Preface

The 1985 ICET World Assembly followed the trend of its recent predecessors in manifesting increased program complexity and greater variety in topics of discussion. In addition to the many plenary sessions, there were panelists who reacted to the plenary presentations, and there were some 60 concurrent session presentations.

The volume is organized according to World Assembly themes. Under each theme, there appear selected major addresses given during the plenary sessions. Also appearing are selected comments of panel members, and abstracts of concurrent session presentations.

In addition to the four thematic sections, the volume opens with messages from ICET president-pro tem Edward C. Pomeroy, and ICET Board of Trustees chairman W. Clement Stone. A special Pre-Assembly Program on Canadian Foreign Policy is represented in the addresses of Paul Heinbecker and Robert J. Moore.

This World Assembly included the inauguration of the W. Clement Stone Lecture Series, the first of which was delivered by Stephen Lewis, Permanent Representative of Canada to the United Nations.

The keynote address of Jack R. Taub serves as the introduction to the Assembly theme.

Joost Yff
Associate Executive Director,
and Volume Editor

A Note About the Abstracts

Abstracts within the four thematic sections of this volume are ordered alphabetically by authors' surnames. The abstracts were prepared by Catherine J. Butler and the staff of the ERIC Clearinghouse on Teacher Education, Washington, DC.

Those papers that were selected for addition to the Educational Resources Information Center (ERIC) include an ERIC system document number, which is preceded by "ED" or "SP." Papers in the ERIC system are accessible in microfiche collections around the world. Persons interested in obtaining papers that are not in ERIC are encouraged to contact the authors.

A Message from the President

Thirty-Three Years of Service to the Teaching Profession

Organized to improve the quality of teaching throughout the world, the International Council on Education for Teaching (ICET) has for over three decades been about its task. The Thirty-Second ICET World Assembly, held in the breathtaking setting of Vancouver, British Columbia, Canada offered a renewed opportunity for ICET to further its commitment to improving the quality of education.

The theme, "Education in the Information Age: The Impact on Teacher Education and Teaching," provided a thought provoking agenda for considering issues central to educational improvement at this time in history.

Stephen Lewis's presentation of the First W. Clement Stone Lecture, "The Multilateral Imperative: International Issues in Teacher Education Curriculum," opened the Assembly with an impassioned reminder of the need for multilateral approaches to global problems. It would have been difficult to select an issue more central to ICET's thirty-three year history, during which ICET has successfully forged a multinational network of educational leaders representing colleges and universities, ministries of education, educational organizations and individuals. By means of its annual World Assemblies, ICET has maintained a much needed international focus on significant problems and issues facing the worldwide task of improving education.

As one studies the scope of the papers presented at the 1985 World Assembly, it is clear that the increasing availability and usefulness of information technology is challenging educators in all parts of the world. The proceedings which follow are a rich guide for educational planners and for those preparing educators for the future.

The International Council on Education for Teaching is proud to add this publication to its growing bibliography of international educational thought. A deep debt of gratitude is expressed to the members of the 1985 World Assembly Planning Committee under the chairmanship of Russell J. Leskiw for their great success in blending a significant and stimulating educational program with a beautiful, exciting and comfortable venue.

The Vancouver Assembly was a valuable opportunity for ICET to renew the multinational lines of communication between educational leaders. In face-to-face meetings, the base for improving the quality of education worldwide has been strengthened. ICET members salute their founding predecessors, the Board of Trustees, the Board of Directors, and Executive Director Dr. Frank H. Klassen and his devoted and skillful staff for making this Assembly possible.

Edward C. Pomeroy

A Message from the Chairman, Board of Trustees

Motivation in Teaching

The art and the power of motivation for educational development is my specific interest. My contribution to this conference is to share with you knowledge which has proved effective in motivating countless thousands of persons to learn, understand, comprehend and apply the art of self- motivation, and to motivate others to motivate themselves; to develop a positive mental attitude, or PMA.

Throughout the history of education it has been said that "knowledge is power." This is fallacious. Knowledge is not power. Knowledge is potential power; it is not power until it is applied. Gasoline in your car is not power, it is potential power, it is not power until you use it. Yet throughout our educational systems students have received passing grades primarily through the use of their memories; we have been checking the fuel gages but not trying to see how well the cars can run.

Those of you who have passed psychology courses have gotten credit for memorizing principles. It is likely that neither the teacher nor the students ever learned how to apply and actually use those principles. In these instances, the art of motivation has not been taught. That is, how to recognize, relate, assimilate, and apply principles, particularly in the behavioral sciences, as regards the functioning of the human mind, was not taught. Now what do I mean by that? I will explain.

You recognize a principle, idea or technique when you find yourself saying, "Hey, that's for me!"-- when you know you have run across something that applies to you. You relate that principle, idea, or technique to yourself when you answer these questions: "What does this mean to me?" or "How does this apply to me?" or "How can I use this?" You assimilate a principle, idea or technique when you incorporate it into yourself--when you make it become a part of you. And you put the principle, idea or technique into application when you get moving--when you follow through with ACTION.

I would like to share some ideas on how to learn and apply the art of motivation with PMA, which is explained further in Success Through a Positive Mental Attitude, a book co-authored by Napoleon Hill and myself. You are the most important living person as far as you and your life are concerned. You are the product of your heredity and environment, and you are an entity comprised of your physical body, your conscious and subconscious mind, your experience in thought and action, and something more, including powers known and unknown. You have the power to affect, use, control, neutralize or harmonize with all of them. You can direct your thoughts, control your emotions and ordain your destiny with a positive mental attitude.

There are three ingredients that are absolutely imperative for continuous success. One is the necessary knowledge of theory about the right way to achieve a specific objective or goal. The second is know how or actual experience of doing it the right way to get the right results. And the third is inspiration in action; specifically, how do I motivate myself and how do I motivate others? A person may know exactly what to do and how to do it, but he may not feel like doing it when he should.

If a person wants to overcome procrastination, if he wants to get into action when he should, he can use self-suggestion: memorizing three words that will flash from the subconscious mind to the conscious mind in time of need. The three words are do it now! When this self-motivator does flash from the sub-conscious to the conscious, if the individual will act immediately on small, easy matters, he will develop the habit so that he will act when great opportunities present themselves, even though he might be hesitant or afraid.

With an original investment of $100 and this art of motivation with PMA, I built the largest insurance company of its kind in the entire world. Let me go back to give you a little of my background. I was born in poverty. We lived in a poor neighborhood. My father died when I was very young. My mother was a seamstress and worked during the day. She established her own dressmaking establishment and did very well. I sold newspapers at age six. I went to a public school and at age nine I learned that which was not taught: how to recognize, relate, assimilate and apply principles into my own life. At age twelve I had my own news stand; at age 16 I sold insurance, and I dropped out of high school. At age twenty I went to night school, got my diploma, and continued on at a university where I spent two and a half years. At that time I read a book, The Magnificent Obsession, by Lloyd Douglas. The essence of the book is that when you do good for others without thought of personal gain, without recognition, without expectation of financial return, the rewards are fantastic. They come back ten thousand fold. I read that book throughout the entire night. It thrilled me. It excited me. In the morning I made a resolution from which I have not deviated. I developed a magnificent obsession. My magnificent obsession is, was, and always will be, to change this world; make it a better world for this and future generations. Can it be done? It is being done.

In 1937, I was given a book, Think and Grow Rich which corresponded with my own philosophy, as I am sure that many of you will find when you read this type of literature. Because the philosophy corresponded with my own, I sent the book to all my sales representatives, office employees and staff. Suddenly, we found the key! People learned how to motivate themselves to achieve their goals. We found the vehicle whereby we could help a person who wanted help, to help himself using universal principles, which many of you are unconsciously doing already. I find that everyone who is ready, if he or she has a positive mental attitude, can become successful as an individual and as a contributing member of society.

What does this mean to you? It depends upon what action you take. You are in the greatest profession of all, helping and teaching those under your supervision. Be you teachers of teachers or teachers of adults, children or youth, you not only affect their lives but countless others as well. What's going to happen to you depends upon whether you develop a positive mental attitude and thereby unleash an unlimited store of energy and creativity.

W. Clement Stone, Chairman
Board of Trustees, ICET

SECTION I

Pre-Assembly Program

Canadian Foreign Policy and Canada's Role in International Development

Overview and Major Tenets of Canadian Foreign Policy: Past, Present and Future

Paul Heinbecker, Minister
Embassy of Canada
Washington, D.C., U.S.A.

I have been asked to talk to you about the major tenets of Canada's foreign policy. Many of you here today are Canadians, but many more are not, so I am going to first talk to you about Canada and the attributes which shape our policy. Then I will talk to you about a rapidly changing world, its meaning to Canada, and its meaning in the daily lives of yourselves and of the students you teach.

The way in which any nation approaches foreign affairs begins with its national attributes: its natural and human resources; its social character, values and aspirations; and its geographical position and affiliations. What a country essentially is domestically determines in large part what it does internationally.

You will have noticed, especially if you have come here from or through Europe, that this is a very big country geographically. It is the second largest in the world with five time zones coast-to-coast, and five regions that are as distinct as most countries. The people in Newfoundland on our east coast live closer to Europe than they do to this city. There are 800 forest fires burning today in British Columbia alone! In population terms, Canada is a rather small country with 25 million people--only 2.7 per square kilometer.

We have, as you all know, a cold country--a land not intended for the frail. But we are, you may be surprised to know, a hot country; the bulk of our population lives closer to the equator than people in Stockholm and Moscow do, or those in Paris, Milan, Wellington and Sapporo.

We have been blessed by vast natural resources which have provided a strong agricultural base, a wealth of exportable minerals, forest products, fish, and immense hydro-electric potential. These attributes have shaped our industries and trading patterns, and until recently, assured our prosperity.

Our values are the product of the world's great religions and ideas. They are given expression by the two tongues, English and French, that are our official languages, and they are shaped by the systems of thought those languages convey. Our ethos has been tempered by the mores of immigrants from every country in the world and by the culture of our own native people. We are a young nation but one of the world's oldest democracies. We are a mosaic of cultures and languages and colours. Although we are not a melting pot, some of the lines of our mosaic are blurring.

To help ourselves govern this diversity, we have created a federal system of government. Comparatively, we have a very decentralized system, with ten very strong provincial governments.

We are North American but not American. Our relationship with the United States is very strong. The Americans are our largest trading partners, our only environmental neighbors, and our closest allies. This closeness to the United States is a uniquely valuable attribute and is for us the dominant reality of our foreign affairs. But the asymmetry of that relationship is at times a cause of concern for us. Conducting relations successfully with the United States is the most basic Canadian foreign policy objective. The largest trading relationship in the world is between Canada and the U.S.A., twice that of Japan, and equal to that of the European Economic Community. Seventy-five percent of our trade goes to the U.S.A., and the Canadian Government is currently considering ways to secure and enhance that trade.

We are an Atlantic nation, committed to the security of our Western European allies. We are also, and increasingly, a Pacific nation; our trans-Pacific trade and immigration have grown to the point where these exceed trans-Atlantic flows.

We are an Artic nation. We think of ourselves as special in part because of the unique character of this vast region. We are concerned about the special security challenges it presents. We lie directly between the two superpowers as the geese fly and as missiles could. We have benefitted from the natural buffer represented by three vast oceans. In simpler times, these expanses of water have separated us from most real and potential enemies.

Finally, we are a nation of the Americas with a stake in the future of both continents in this hemisphere.

What all this adds up to is that we are a western, industrialized, democratic country with worldwide interests, but without the geopolitical weight or reach of a superpower. So we have had to make common cause with others to achieve some of our goals. To safeguard our security, we are founding members of NATO and allied with the United States in NORAD. To safeguard our prosperity, we are parties to the GATT, the IMF, the IBRD and the OECD.

To safeguard our larger political interests, and to help make the world work, we are members of the UN, and its specialized agencies. We are also members of two unique international organizations: the Commonwealth and La Francophonie. Membership in these organizations gives us rights, responsibilities, insights and opportunities.

Bilaterally, and through these institutions, we make our contribution to a safer, saner, better world. But these institutions have come under pressure in recent years. In the 1970's, the concept of interdependence moved from the textbooks to sometimes brutal reality. No country, not even the strongest, can stand entirely alone anymore, economically or strategically.

Beginning with the oil shocks, and continuing through the major recession of the early 1980's, we have all been caught up in global problems of unprecedented complexity and stubborness. In both North and South, the economic down-turn fuelled protectionism to such an extent that the international trade framework began showing signs of fatigue. The developed countries of the North have had to contend with very high budgetary deficits and high interest rates, volatile or misaligned exchange rates, flagging productivity and competitiveness, deterioration in export performance and stubborn unemployment. The developing countries have had to cope with massive and chronic indebtedness and the serious negative effect of Northern recession on Southern exports. Although we have moved some distance away from these crisis conditions since the early 1980's, the current recovery in most countries is modest. High unemployment and protectionist pressures continue. We are not yet out of the woods.

The economic strains of recent years have been accompanied by major political tensions and conflicts. During the past 15 years, we have witnessed a series of "local" conflicts that have in fact involved violence and human rights violations on an appalling scale. These conflicts in Indochina, South Asia, the Middle East, Africa and Central America have acted as a magnet for superpower rivalry and have contributed to a general heightening of tension.

More ominously, relations between the two superpowers degenerated into what might be called an international political recession, a situation that was as threatening as any since the Cold War. Fears of a nuclear holocaust were heightened throughout the world. Although there have been promising signs in recent months, the way ahead is likely to be both difficult and dangerous.

We in Canada are no longer, if we ever really were, immune from any of these developments. During the economic recession of the early 1980's, real economic output declined in our country as elsewhere, unemployment rose and interest rates skyrocketed. We lost 575,000 jobs during the recession, as well as countless homes, farms and small businesses. We felt increasing concern about our security as the international political climate worsened. The "nuclear winter" thesis suggested that no one would escape a thermonuclear war. We became more sensitive to our own vulnerabilities.

What all of these developments has led to in Canada, as elsewhere, is a deeper appreciation of the importance of international affairs. We realize that foreign policy is not some sort of grand, intellectually abstract system. Still less is it the exclusive preserve of conference jet-setters, or a subject for elegant diversion at languid dinner parties. It is as real as jobs, unemployment and the brutality we see on the news each night. There is nothing hypothetical about it.

As foreign affairs matter to individual Canadians and as these Canadians have something valid to say on foreign affairs, the Canadian Government is consulting them on foreign policy. A parliamentary committee is currently conducting a major cross-country review of Canada's international relations, the first full review since 1970.

International affairs affects every Canadian: the British Columbia lumberman, the prairie farmer, the Ontario autoworker, the Quebec manufacturer, the Maritimes fisherman. Our Government is, therefore, consulting these Canadians on foreign policy.

To assist in the review, the Government produced a discussion paper, called a Green Paper, entitled Competitiveness and Security. This Green Paper speaks directly to what have emerged as key government preoccupations. In an increasingly tough world, we have to define our interests with brutal realism in light of what we are, what we can achieve, and what we must do. The Government believes that Canada has to become more productive. There is no contradiction between doing well and doing good. The first is, in fact, a precondition of the second.

Therefore, we have to make ourselves more competitive. We rely more than almost any other major country on trade. Thirty percent of the goods we produce are exported. We have to work very hard on promoting our products abroad. At the same time, we have to take great care that we do not inadvertently undermine the international trade and finance system. The Government is also taking steps to bolster Canadian national security and to reaffirm our commitment to the Western Alliance.

But this is not at all to say that our definition of national interests is limited to prosperity and security. We have to be hard-headed in defining our interests, but we do not have to be narrow. Morality is also a national interest, a very basic one. The Canadian Government has reaffirmed Canada's traditional commitment to human rights at home and abroad and to helping others develop their own economies. Our budget to help these countries is about 2 billion dollars, the bulk of which goes to the world's very poor countries.

Assisting Third World development responds not only to Canadian values. It is obvious to us that in an interdependent world, the prosperity of the North and of the South is mutually reinforcing. Doing good also helps us do well. The security of each is affected by the security or insecurity of the other.

Is all of this remote from you or your profession? Not at all. You do not have to be a foreign affairs expert to feel the effects of an increasingly interdependent world on daily life. This is where you come in as citizens. This is where you come in as teacher educators. This is also where your students come in. Your students worry about a nuclear war and about preventing it. They worry about jobs in national economies increasingly dependent on foreign markets. They worry about international terrorism. In many of our countries, they have to cope with an alarming increase in narcotics flowing into their societies from abroad. They have to cope with rapid social and technological change. What can you do as teachers? I appreciate the fact that I am invading your territory, but please forgive me for making some suggestions.

First, you can try to counter the notion that the international system is some sort of appallingly malevolent, out-of-control machine that is going to chew us all up. It is worth emphasizing to students that their hopes for a saner world depend critically upon international institutions and relationships. These institutions and relationships, in turn, are managed or mismanaged by national governments, and governments, at least the democratic ones, are made and unmade by electorates. So the public is not powerless in international affairs.

The second and more immediate thing you can do as teacher educators and educational administrators is to look closely at the mix of skills that your students are developing. Given what you know about international affairs and your national economy, and about what it needs in order to compete in the world and create jobs at home, have you reviewed how well your educational institutions are doing compared to those of your allies and adversaries? Are they producing people with the right mix of training and skills to take advantage of changing international circumstances and to contribute to national and international prosperity? Are your students being prepared for the next economic battle rather than the last one? Are they being schooled in the importance of living with others peacefully? Let us all hope that the answer to these questions is "Yes."

Perhaps I could conclude with a reference to the major theme of this conference, that of the Information Age. Even with the provision of sophisticated hardware and software, what the present age often seems to represent to all of us, including students, is an immense flood of data that threatens to swamp us. What we do with these data is as much a political question as a technical one.

It is trite but true that none of us (Canadians, Americans, Africans, Asians, Europeans) can afford any longer to be ignorant about the world or about each other. The dangers are too great, and the consequences can be final. There really is no alternative to understanding each other better. Schools have a pivotal role to play. It is crucial that our children understand that they are part of a bigger world, that the world is competitive and dangerous but that it can also be magnificent, and as a minimum, it can be managed. To prosper, they must be world class. The world will need their vision. They really can make a difference.

Canada's Role in International Development

Robert J. Moore
Senior Policy Advisor, Special Programmes Branch
Canadian International Development Agency, Ottawa

The first time I came to this province, I had a comeupance which almost prevented me from ever coming back. I was giving a lecture over in Victoria to a group of retired people and was talking about some aspect of the history of Guyana. As I picked up a governour's dispatch and began to quote it, someone in the audience said, "Stop quoting my dispatch and let me finish it for you!" The man had been lieutenant governour of British Guyana in 1923, and he was still alive. What is more, he said, "Young man, if you will sit down and shut up, I will give the rest of the lecture for you," which he did. I am hoping that that peculiar experience does not recur this afternoon, although I would not be surprised if it does.

My job this afternoon is to talk to you about Canada's role in international development. I want to begin by saying that, although when you look at the conventional Mercator's map of the world, you will find Canada perched well in the north, it is really a magnificently cross-roads kind of country. If you look at Canada in this way, you will find it in the middle of an expanding mesh of contacts.

First of all, Canada is of the Americas, but not the arctic extension of the United States. She has to live in potential conflict with a superpower, sharing many convenient arrangements with that power. She has also developed a vocation to remain distinct from that power, and to decide on her own options on criteria of her own making. The thing about Canada that I noticed most when I first came here was that she has not developed an "either/or" philosophy; she has a "both/and" philosophy. She has developed a talent for flexible and varied relationships and as a result, she has an international stance which is robust yet subtle.

The second thing about Canada is that she is a Commonwealth country. In fact, had there not been Canada, there might not be a Commonwealth as we know it today. Canada is the progenitor of the Commonwealth and as a result, she takes a very strong, courageous, and flexible interest in the Commonwealth. This is extremely useful because four-fifths of the Commonwealth consists of developing countries. The qualities of the Commonwealth that distinguish it from any other association of nations are qualities that Canada seems to have created. There are three, really: informality of consultation is considered more efficacious than formality of negotiation; organic networks are deemed more lubricating than rigourously defined constitutions; and divergence in political ethos does not preclude convergence in political interests.

There is one other thing. Canada is the result of the collision and collusion of two founding linguistic groups: the Francophones and the

Anglophones. This means that when the country reaches out to the Third World, she reaches out both in French and in English. Quebec, which has always had a querulous but creative connection with the confederation of Canada, has a vocation to spread Quebec's message in particularly Francophone Africa. This means that with an even hand and a good deal of tactful equilibrium, Canadian aid has been organized for Francophone Africa and Anglophone Africa.

When we put all these things together, it is clear that Canada is not decaffienated America, but rather it could be described as being bounded on the north by mystery and on the south by hegemony, on the east by history and on the west by the East. These are fundamentally important aspects, especially as they relate to the whole business of international development.

How do these convergencies of qualities affect Canada? What are the drives that bring Canada to be so concerned about Third World development? I see three: first, mentioned earlier, the dictates of international stability; second, the dictates of international trade; and third, the dictates of humanity. Put another way, Canada's vocation is trade, its avocation is international stability, and its passion is human relationships.

For education purposes, it is very important that teachers and teacher educators look at Canada's quest for international stability not merely as part of its foreign policy but part of the woof and warp of the pedagogy with which they deal. When Canada looks out at the world, she sees a convergence of crises that makes it almost possible to say that the modern world, which began in 1945, has now come to an end. We are beginning to move into the post-modern era. What are these crises? The first is the nuclear bomb, the second is the ecological bomb, the third is the hunger bomb, and the fourth is the debt bomb. When we put those together, particularly for young people in classrooms, you have to tell them that we have to think of the world that is coming in the twenty-first century in different ways than we have thought of this one. We cannot think that our destruction could come only with a nuclear holocaust. It can come also with ecological breakdown. It can come also with debt and the negation of debt by Third World countries. It can come by hunger and malnutrition, of which the most potent symbol has been Africa in recent months. When we talk to our young people, we have to talk about the regreening of the earth and show them how ecological problems are related to fertility problems, fertility problems to debt problems, and debt problems to nuclear problems. And with all of these bombs ticking away in the developing world, it is quite likely that there is where the real beginning of the holocaust, if it every comes, will lie.

Between this moment and twenty-four hours from now, 40,000 children will have died of malnutrition and preventable diseases. That is an unstable febrile world, and it is a world in which almost anything can happen. Canadian development assistance, therefore, begins on the premise that its aim must be to reduce these horrendous situations in an attempt to produce a world of greater stability. In short, Canadian policy makers take seriously the image, "Spaceship Earth," and argue that whether we are going first class or steerage, it is very important that there do not break out horrendous fights between the passengers, for if they do, this spaceship will be a smoking ruin. The search for global stability is the first principle on which Canadian international overseas development assistance is based.

The second great impetus is the dictates of trade. You heard this morning that the Canadian economy needs trade to survive. Canada must sell its raw materials in order to be able to buy industrial ones. Since Canada has to live by trade, she has to develop a network of relationships in which trade is facilitated over and above those it has with the United States. Canada recognizes from the experience of the oil price hike that she has a vulnerable economy. She must reduce her vulnerability by increasing the number of points of contact with other countries so that if any one is closed out at any time, she has an alternative. Even more fundamentally, Canada recognizes that the Pacific rim is a growing area. Asia is on the move. Some of the finest strides in development have been made in India, Bangladesh, Indonesia, Thailand, China, Singapore, and a number of others places. When Canada now goes to give aid to these places, she is being treated sometimes as if she is a suppliant. What is more, when Canada designs a dam with India, she often finds out that India is putting up as much money as Canada to build it. The recognition is coming home that in Asia, where three quarters of the world's population will live by 2000, there has developed a sophistication that is turning the original donor/recipient relationship into one of equal cooperants. What this means is that the old business of giving assistance in terms of food aid, building railways, or establishing the power grid for Pakistan, is now rapidly becoming a new business characterized by mutuality. The truth is that Canada needs Asia now more in its trade than Aisa needs Canada.

What is important here is the historical relationship. The original intent was really to increase the effectiveness of human resources for countries that had just recently become independent. That plan gave way to a number of other aid plans and those plans have given way to a rising technological base particularly in India but also in Indonesia. That is the base that is now becoming the base of mutuality. And Canadian food aid is no longer necessary in India, for India produces enough food to feed herself. India is moving into the "high-tech age." Where India needs Canadian assistance is precisely where Canada is superb in giving it. It is in the conquest of space by technical infrastructure that Canada now offers her best services and those services are accepted on the basis of equality.

Those who administer Canadian aid are discovering an interesting set of features. As the aid to India and Malaysia have gone down, so the trade between Canada and India and Malaysia has gone up. But there is a difference: there are more imports from these places into Canada than there are exports from Canada to those places. Trade therefore is fundamental to Canada, and aid is a component of this trade. Of the two billion dollars in development aid given by Canada in the last four or five years, practically one billion results in the importation of Canadian goods and services. Some people object very strenuously to this because they argue that it is "tied aid." Those who administer the aid policy of Canada say that tied aid is likely to be supported by the voters far more than aid that is not tied. This may in fact be the case. However, behind that is the fact that tied aid stimulates demand for Canadian goods. And thus it confers certain developmental benefits on those who receive it while it also confers gross benefits on those who give it.

Having thus dealt with the dictates of international stability and of international trade, I turn to the dictates of humanity as the last of the three drives mentioned earlier. Canada was founded by two groups, Catholic and Protestant, both of whom were strongly religious and both of whom spearheaded very powerful missionary movements in the nineteenth and twentieth centuries. The powerful, secularized missionary impulse is still at work among Canadians who, whether they believe in religion any more, believe that it is fundamental to the human condition not to see their fellow human beings suffer from preventable diseases, malnutrition, and from early death. This feeling runs deep within the Canadian psyche. But there is something more fundamental and very surprising: the Empire Loyalists left the United States disliking the American revolution. Some people say that they disliked it because it was too middle-of-the-road and they were too right-of-the-road. What they really disliked about the American revolution was its liberalism: the assumption that the economy is really a mutuality of competing cupidities kept together from exploding by the hidden hand either of the Diety or the market. The Canadians or Americans who left the United States to come to Canada and the people of Quebec who rejected the French Revolution preserved a tradition that has helped to inform if not create the Canadian humanitarian impulse. That is the old European style Tory tradition which emphasizes the common good and regards government as responsible for promoting and protecting it. Canada has "Red Tories," as you know. The Red Tories are a very interesting group because they are the successors of the radical Tories of the late eighteenth century who actually wanted government to defend the poor against the rich. This, too, has become part of the psyche of many Canadians. And there is one other minority tradition: the Socialist tradition, exemplified in Canada partly by the NDP and partly by a number of non-governmental organizations. That tradition, nourished in Canada by all sorts of religious and secular movements, comes out both in government policy and in the behavior of the non-governmental organizations.

When you put all of these drives together their effect produces some interesting statistics. For instance, the Federal Government puts about two cents of every dollar it spends into the foreign aid programme. That amounted in this fiscal year to 2.1 billion dollars spent on overseas development assistance. This figure will rise to 2.5 billion next year. It looks like a lot of money, but when you spread it across the populations of the countries that Canada helps, it amounts to one dollar per person per year. Compared to other industrialized countries which give on a per capita basis, Canada falls in the middle of the distribution of industrialized countries with aid programs. A quarter of that 2.1 billion goes into a variety of channels including not only CIDA, but also the International

Development Research Centre (IDRC), PetroCanada International, the World Bank, the Arab Fund and a number of other programmes.

The IDRC is one of the most interesting examples of the Canadian imagination. It is a body structured on the assumption that developing countries need research as much as they need development assistance. They cannot easily finance the research out of their own funds so these funds are made available to them through an international organization that is paid for by Canada.

One of the loveliest examples of the sort of research that IDRC does is in connection with the water buffalo. There was a time when we all told developing countries that they must abandon their draft animals in agriculture and replace them with tractors. They bought them, sometimes in cooperatives, with long installment payments, some of which were never completed. And then the oil price hike came, and the tractors became unusable because the gas was unavailable or too expensive. Many of the people in India have a wonderful animal called the water buffalo. It pulls the plows in the fields, it gives milk to the family, when it dies they can eat its meat, its skin can be used for suturing in medical operations, and it can be looked after by little boys. What is interesting about the water buffalo is that it does work both in the USSR as well as India and Florida, which suggests that its skin is impervious to variations in ideology. Instead of trying to give people gasoline, IDRC has set up a research center to look at the life cycle of the water buffalo and to encourage its use. The water buffalo is now making a comeback in India; as one Indian put it, "We have now re-invented the water buffalo."

Another example of IDRC activity is with respect to the rickshaws that are found in many parts of Asia. IDRC and other research institutes have worked toward developing the rickshaw into a perfect instrument of transportation, giving hundreds of thousands of people a living which they would not have if the motorcar were to replace them.

This kind of research in which the available technology is made more proficient is the sort of thing that the IDRC spearheads in collaboration with a large number of research centres all over the world.

Coming back to Canada's overseas development aid budget, CIDA administers that portion that does not go to IDRC and so on in food aid, in emergency relief, agriculture, voluntary projects, and interinstitutional cooperation. These programmes bring together people to form a complex network of activity so that at any given time one could not cut the Gordian knot of development--its strands are too tough, complex and numerous.

CIDA has chosen to concentrate on thirty developing countries. This focus allows us to test the development programmes and to observe them within containable limits. CIDA concentrates on the poorest countries and the poorest of the poor within those countries. Since we have discovered in the last ten years or so that the poorest of the poor are nearly always women, one of the most important aspects of CIDA development assistance is the program called Women in Development. When men ride rickshaws and get paid for it, they are registered in the productive aspects of a nation as "employed." When women do the brunt of the agricultural work in developing nations, working from sunrise to sunset and then turning around and looking after the children and keeping the household clean, that was not interpreted as productive in terms of their contribution to development. A great concentration of CIDA aid is going into Women in Development because when women attain basic reading skills, they can at least read a package to see what they should or should not give to their babies. They can read a warning not to drink water in a certain pool. We have discovered also that the quality and quantity of farming goes up as women are educated.

As the minister responsible for CIDA said the other day, "In order to concentrate on agriculture, you have not only to look at land, you have to look at trees. No trees, no soil. No soil, no agriculture. No agriculture, desertification and famine." If I were a teacher in a high school, I would try to get my fellow teachers to link up the relationship between trees, land, poeple and economics. I know from my own country that when we cut the trees down for export, and did not replant, we left soil exposed to the rain which washes it down the river, and then the barrenness begins to come, the moisture in the soil disappears, the rain pattern is tampered with, the rainfall is less and aridity spreads. I would also point out to the children that every one of the world's great religions has a tree as one of its central symbols. The crucifixion is a dead man on a dead tree. The resurrection takes place in a flowering garden. The Lord Buddha had his greatest inspirations under a tree which is known to live for at least two thousand years. In Japan every shrine is leafy, and the Japanese consecrate their trees to such an extent that their forests are the best preserved; they do not cut down a tree without planting another. I would bind the curriculum together to unite a whole number of things, for that is the only way our children will make sense of the ecological havoc that we are raising and see the ways in which we can begin the regreening of the earth.

Although in 1983 CIDA was supporting 700 bilateral projects in more than 80 countries, had about 780 Canadians working on the projects, and was supporting 840 trainees from developing countries in Canada, CIDA is not the only development agency in Canada. An important additional dimension is represented by the voluntary sector. The present government is giving greater emphasis to the voluntary sector (what we in Canada call the non-governmental organizations, and what are known in the United States as the private voluntary organizations). The non-governmental organizations (NGO's) consist largely of three kinds of people. The first are those who manage and finetune the large facilitating agencies. These are the mandarins, the managers, the beaurocrats and civil servants. The second are those with visions of alternative possibilities who proceed to create the vehicles to express those possibilities. We call them academics and catalysts of fluid constructs. These people allow themselves to dream of things not yet done or not yet done in the way they think they can be done, and they proceed to do them. And the third kind of people the development effort needs are those who turn individuals with common concerns into communities with common interests, and then link them between the First World and Third World.

You have heard the phrase, "Small is beautiful." What is means is that small is communal, and that is precisely what the NGO's are about. The NGO community consists largely of the prophets, the academics, the catalysts of fluid constructs. They consist also of those people with a passion for relating people in communities; they link small groups of Canadians with small groups of people from Peru, Ecuador, Bolivia, Guyana, Trinidad and Ghana.

One of the most creative things about Canada is the relationship between the non-governmental organization constituency and CIDA. CIDA sees this constituency as a vibrant, vital part of the development effort. It is estimated that at least one billion dollars of donations come from Canadians through the voluntary sector every year. Ordinary Canadians, who want to participate in the development process, but who feel they do not have the time or the skills, give their support through the various non-governmental organizations. It is estimated that three million volunteers are involved in organizations in Canada. It is estimated also that the development work they give in kind has a value of some 4 billion dollars. That is an outstanding achievement for a country with a population this size, and indicates the strength of those traditions which still pervade Canada: the old Tory tradition; the Socialist tradition; the old religious missionary impulse gone secular.

We all believed in the trickledown theory of development in the 1950's and 1960's. Some people have argued that development should never be from the top down. Making the rich richer did not automatically make the poor less poor. Nevertheless, some development has to be from the top down. But, the full potential of what is being done will not be realized unless there is also work from the bottom up. That is where the NGO's are significant and vital. Canada employs both the top-down and the bottom-up relationship, which is typical of Canada. We work up to the Federal Government and down several layers of government to the ground. We understand by experience and by historical exposure the combining of top-down and bottom-up. This is what makes Canada's contribution to international development particularly vital and almost unique.

Development concerns itself with composition, not imposition. Development increases the potential to make conscious choices. Development is diffuse. Development measures peoples' capacities to govern and to organize their universe. Development does not trickle down like water; rather, it grows like a flower upward. Development continues to be something that we have learned by experience and the way to approach it is not by deduction or rationalization but by the inductive method, and that, too, is a fundamentally Canadian characteristic.

SECTION II

The First W. Clement Stone Lecture

The Multilateral Imperative: International Issues in Teacher Education Curriculum

The Multilateral Imperative:
International Issues in Teacher Education Curriculum
The First W. Clement Stone Lecture

Stephen Lewis
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I am honored immensely to give the first in the W. Clement Stone Lecture series. I only now met Mr. Stone; I know of him only through the remarkable curriculum vitae which is included in your conference material. I am glad to share, Mr. Stone, in those accolades, but I hope that your private sector credentials are not sullied by this benediction from a Socialist. I am always worried lest the heresy that I embrace rubs off, unhappily, on others.

My experience as a teacher has left me with a lasting impression. At one moment in my life, I went off to Africa and taught in Ghana, Nigeria, Uganda, and Kenya. I remember quite vividly my teaching extramural studies at Lagon University in Accra; and I remember my going out to little villages within a fifty mile radius of Accra, travelling with kerosene lamps and my own library, to teach English and History to coco marketing employees, policemen, firemen, teachers, and others who were interested in attending. This experience made on me a tremendous impact; I was exposed to such an insatiable and exquisite lust for learning that I carry the impression to this day.

There is another impression that I have, and that is about the appropriate role of technology in education. My wife recently finished a book which she has been writing for more than a year and a half--a book on childrens' literature. One of the themes of that book is the need for childrens' literature as an antidote to the unrelenting force of the electronic media and of television in particular. In an age of communication, it is important not to surrender everything to technological hegemony. And if it is not too perverse, I want to say that at the outset of this conference, which will be preoccupied with things technological.

I used to speak on a regular basis at teacher development days around the country. I have been astounded at the number of teacher development days over the last three or four years devoted to the use of the computer, as though it was the civilizing instrument of western culture. There was one course after another on computers in history, computers in English, computers and moral values, computers and science, computers in biology. The entire educational curriculum was viewed as being sustained by technological innovation, as though there were no other dimensions of the soul to be nurtured. I found myself saying to teachers, "Do not forget, in the rush to the technological hegemony, the humanities, art, music, poetry and literature. Never let them be obscured by the mad embrace of the microchip. Never let the important balance among these be lost as we move so irresistably to the technological imperative." It is a particularly important balance in the world of teacher education, where one is ultimately dealing with those who educate the world's peoples. If I was looking for educational issues around which to focus, this would be one of them.

But there is another issue, and it is one that I want to address today. Although it will not speak to the specifics and complexities which will engage you over the next three or four days, I hope it speaks to something rather more broadly based. It is necessary, now and hereafter, to engage teacher training in a way that emphasizes and enlivens international issues. It has never been more imperative than it is now. It is desperately necessary in this interdependent world, and it is crazy to educate kids of any age--elementary, secondary, post-secondary--without some significant emphasis on international issues. Although I do not want to be rude or inappropriately unappreciative, I must say that even in this country which I love, there are areas where that is not always the case. I can remember speaking about a year ago to a convention of social science teachers in Alberta. I pointed out to this group of teachers that the Province of Alberta contains so many international issues that are raised just by the phenomema of this province. For example, Alberta is the province in which they do the Cruise testing. What a remarkable vehicle, as it were, to raise questions of peace and disarmament! Alberta is one of the provinces where the first feminist voices were heard. What a wonderful vehicle to use as a discussion of international feminism! I reminded my audience in Alberta that it is the place where James Keestra plied his foul educational trade for so long. Keestra, for those of you who do not know it, is a man recently convicted for the dissemination of hatred--in this case, anti-semitism. What an excellent vehicle through which to discuss international issues relating to racism and genocide! When I had finished making what seemed to me fairly obvious observations flowing naturally and organically from the environment of the Province of Alberta, a number of teachers came up to me privately and said, "We can't do that here, Mr. Lewis, we can't take those issues and turn them into matters of the classroom in social studies. We would never get away with it." And I thought to myself, if you can not use palpable, local truths and elevate them to international issues in order to make learning live for students--in order to have teachers teaching in the best and most liberating sense of the word--then what is education all about? And then I noticed, before I left New York last week to come here, that I was invited to speak to a convention of teachers in the Province of Nova Scotia at the end of October. I shall not, alas, be able to go, but the reason I was invited was because the teachers felt for the first time that they were going to be able to implant educational issues of an international kind in the curriculum, and they asked me to give a fillip to that process. It is 1985. One would have thought that these things would be routine before now. There are very real flaws in education in international terms even in Canada. If this is true in Canada, what must it be like in other parts of the world?

These observations lead me to mention a concern of overriding urgency and one that I would like to emphasize today. I work at the United Nations, and I love every minute of it. The United Nations as an organization, and more particularly, multilateralism as a process, are under attack. We have to mount a considered defense. The defense of multilateralism is in its own way a kind of moral imperative in the nineteen eighties and through to the end of this century and beyond. Sometimes, the attack on multilateralism is extreme, uninformed, destructive, and given to a kind of Pavlovian philistinism, and it comes from groups that are right-wing and reactionary and, generally speaking, not of the center of the political spectrum. Although that kind of stuff is not to be taken very seriously, there is another kind of criticism of multilateralism which is more thoughtful and more substantial and at times more persuasive but like some of the other extravagent attacks, it shares a similar ethos, and the ethos is anti-internationalism. It is amazing how many individuals and groups in this world, particularly in western society, are anti-internationalist. They never want to share even a little of their sovereignty. They never want to give up any or even a minimum of sovereign power in the service of the greater international good. And that seems to me wrong-headed. It seems to me wrong-headed because never has multilateralism been more important. Multilateralism should be one of the centers of good curriculum everywhere around the world. To authenticate this objective, one need only think of the list of current global concerns that threaten all of humankind today: arms control and disarmament; regional peace and security; hunger and famine; disease; and international terrorism.

First, arms control and disarmament, already referred to earlier from this platform. Why include it in any curriculum? The truth of the matter is that arms control and disarmament lies in the hands of the superpowers, and the superpowers will thumb their noses with impunity at multilateral forums. The superpowers will make the decision--whether the world lives or dies--for the rest of humankind. So why put things in the curriculum that only imbue youngsters with pessimism and jaundice, scepticism and despair? Think of it more broadly. Since 1945, there have been 154 conventional wars in this world, with a loss of twenty million lives. Wars proceed apace to this very day. We must have multilateral forums through which to reduce that particular dimension of madness. This condition is not confined merely to the build-up between the superpowers. I remind you that there is something called a Nuclear Non-Proliferation Treaty, one of the greatest multilateral treaties in this world, and one that is coming under review in September. This treaty prevents, ostensibly, the dissemination of nuclear weapons to countries which do not now possess them. It is one of the great multilateral initiatives speaking to peace and to some kind of sanity. It is necessary for teachers and youngsters to embrace and understand those facts. Think of chemical and bacteriological warfare; there are still charges being laid on the use of chemical weapons between Iran and Iraq in that Middle East war--a war of berserkitude, a war of the bombing of civilian populations. It is necessary to have multilateral treaties and conventions in order to put an end to that kind of exercise in human depravity. There is to begin in New York, at the end of this month, a conference on disarmament and development. For the first time, the countries of the world will be getting together in a multilateral forum to deal with the relationship between disarmament and development in a way that responds to the tremendous needs of the developing world. And the argument, which from time to time seems irresistable, is that if you can disarm to some extent, you may find the money to solve famine in a number of countries or to enhance their economic survival and future viability.

These multilateral imperatives exist; it is impossible not to have this kind of subject in the curriculum. Since many schools and school boards resist it, a determined advocacy of multilateralism is needed as a way of speaking to foreign relations in the curriculum. As a matter of fact, even the pressure we put on the superpowers in the United Nations has helped to avoid a nuclear engagement over that last forty years. It has to some extent brought the superpowers back to the bargaining table in 1985, has to some extent fostered the signing of the ABM treaty and the non-militarization of outer space. It has, in other words, conveyed through multilateralism a strength of purpose in preserving humankind that could not otherwise have been achieved. This multilateralism is worth having as one of the centerpieces of a curriculum.

Second, regional peace and security. The sceptics say that strategies intended to achieve it do not work. Look at Iran/Iraq they say. Look at Afghanistan, at Cambodia, at Cyprus, at the Middle East generally, at South Africa and Namibia, at Central America and Nicaragua. And to be sure, all of these areas of potential and actual explosiveness put the lie to any system of international security. Those who do not embrace multilateralism have tried and failed, I remind you. Everybody is trying and failing, not only through multilateral networks; not only through the United Nations network. The United States has pursued a policy of constructive engagement with South Africa for some years. We have seen what has happened in South Africa recently--what is happening in South Africa today. The United Kingdom, the United States, France, Germany, and Canada have tried for a number of years collectively to impress upon South Africa the urgency of giving Namibia its independence under United Nations resolution. We have not been successful. It does not always work inside the normal multilateral context let alone outside it. So, too, the efforts to end the Iran/Iraq war. So, too, the efforts to support the Contadora process in Central America. All of these things are being done by individual countries or groups of countries independent of a formal multilateral forum.

But if we did not have the multilateral forum, we would have nothing. What would we do without multilateralism? We would have no prospect of dealing adequately with those tinderboxes which could overnight turn into international conflagarations. Look at the peacekeeping forces on Cyprus. If they were not there and had not been there for twenty years, I daresay that little island would be in flames. Look at the mediation being done by the Secretary General of the United Nations; for the first time there is a premonition that in the next eighteen months something may be achieved to win a rapprochement on Cyprus. Yes, the civilian bombing of Iran and Iraq is terrifying, but I remind you that for nine months, that bombing did not occur because it was stopped under the aegis of a multilateral institution. Look at Afghanistan. The Soviet Union shows no inclination to withdraw, but there is at least negotiation occurring, there is a sort of treaty-in-place which, were the Soviet Union ever pursuaded to withdraw, would result in some kind of reasonable security for that country. Look at South Africa, engulfed in the obscenity of apartheid, feeling the persistent and continuing crescendo of pressure around the world to bring sanity to that country, and freedom and democracy to the Black population.

All of these are a testament to multilateralism. They are not a measure of its failure. They are a measure of its indispensability. This world does not take apocalyptic leaps into enlightenment. This world moves incrementally, painfully, requiring an enormous patience, in measured centimeters of social progress that occurs in a multilateral community. And that kind of social progress and the history which it conveys has to be part of the curriculum which deals with international relations.

Third, the phenomenon of hunger and famine. This is where multilateralism and communications all come together so vividly. One need only think of Ethiopia. Three years ago, at an international conference sponsored by the Food and Agricultural Organization, the alarm bells were rung about the likely consequences for Ethiopia of the continuing drought and desertification. No one responded.

In 1983, at another major international conference, the Ethiopian Relief and Rehabilitation Commission made a poignant and effective plea to the world to step in before Ethiopia encountered what it considered to be a coming cataclysm of hunger. No one responded.

In December of 1983, the Secretary General of the United Nations made a very powerful plea to the nations of the world on behalf of Ethiopia. No one responded.

In March of 1984, the Relief and Rehabilitation Commission, in fairly bitter words, conveyed what was happening to the country and begged the world to provide aid. No one responded.

In August of 1984, the head of the Relief and Rehabilitation Commission, in a speech etched in anguish, said to the world, "You cannot imagine what is happening to my country. The food is desperately needed; we will lose hundreds of thousands." Some small response was forthcoming, but it was so slow that lives were lost even as the aid was shipped.

It was not until October, 1984, when a British television team entered Ethiopia, that the world became galvanized. What we learned from this is that culture is television and television is culture. When that medium becomes the cultural force in North America, we respond in a way that we will respond under no other circumstances. I make no value judgements. I make only the observation. But it is an observation that recognizes the power of communication. And it is an observation that therefore relates directly to the imperatives of this conference.

We have learned that once the die is cast, once the world understands, then we have what amounts to a virtual victory of multilateralism. Because who is coordinating the aid? The United Nations. Who is delivering it on the ground in conjunction with NGO's and governments? The United Nations. Who has done the statistical documentation of the twenty countries in need and the thirty million people on the verge of starvation? The United Nations. Who has brought together all of the donor countries over and over again and set out for them, chapter and verse, the financial requirements now and in the future? The United Nations. Which organizations are planning for the long term rehabilitation and survival of the African continent? Primarily the United Nations Development Plan and the World Bank - both creatures of the U.N. In other words, in one of the most grievous and calamitous periods in the human condition on the African continent, it is multilateralism which has come to the rescue. And when the Organization of African Unity makes a plea to the world for the long term in order to have that continent survive, the long term is gained through multilateral action.

Thus, it is important internationally--in school systems across this world--that these ideas are discussed and understood. It is important for students to know what has happened in China and the extraordinary internal regeneration of that country. It is important for students to know about the green revolution in Asia and what it has meant for yields per acre, for crop production, and for the provision of food indigenously for people who were impoverished and famished. It is important for youngsters to know the nature of debt, the nature of cash crop prices, the nature of dependent economies, the nature of the encroachment of the desert, the consequences of drought, and what interest rates do to countries. It is necessary for them to understand all of these things and to recognize, I think, that however one feels, a multilateral environment is what provides the solutions.

Fourth, disease. Our multilateral environment has achieved for us a number of international objectives which are so exciting and so compelling that we will not see their like again. The World Health Organization eradicated Smallpox from across the face of the Earth. Do you want to know something rather interesting about that which I admit I did not know until recently? That proposition, of eradicating Smallpox, with the extraordinary benefit to children everywhere, came from the Soviet Union in 1958. And it was resisted because of that tendency we have, East and West, to be polarized and to resist the good ideas of each other. The idea was resisted for a number of years, until it was picked up by a group of medical doctors in the United States in the late sixties who made of it a kind of cause celebre and decided to collaborate, East and West together, in what they saw was the possibility of getting rid of Smallpox. And in 1980 the World Health Organization was able to publish its momentous bulletin saying that this objective had been achieved. A magnificent example of multilateralism. Well now look at the United Nations International Childrens Emergency Fund. Not only does UNICEF save 400,000 children under the age of five every year, but it is engaged in a three-pronged child survival revolution: 1) oral rehydration therapy to overcome the dehydration and diarreah which are the strongest child killers in the third world; 2) strong support for breast feeding throughout developing countries in order to overcome the disasterous consequences of bottle feeding propagated by so many of the multinational companies for the purposes of profit; and 3) the target of 1990 as the year for universal immunization of all the children of the world under five years of age. It has happened in Colombia and El Salvador. It is happening in India, Bangladesh, and Uganda. It is one of the most exciting things because when there is universal immunization by 1990 everywhere in the world we will save five million lives a year. One of the things I am so proud and happy about in terms of Canada, is that we are pursuing this immunization policy as vigorously as any country is as a way of demonstrating the value of multilateralism.

Fifth and finally, let me point out to you a phenomenon with which you are equally familiar: international terrorism. How can any such phenomenon be handled by one country alone? All of us surely understand that if ever there were a multilateral imperative, this is it. Having experienced the horror of the CP Air bomb explosion and the as yet uncertain but always anxious revelations awaited from the Air India investigation and the Armenian terrorists in Canada, Canada has learned that these things necessarily have an international dimension. So too has New Zealand, in the bomb explosion on the Rainbow Warrior. I was shocked this morning when I listened to CBC radio and heard of the bomb explosions in Copenhagen. Copenhagen! Copenhagen in peace time! Denmark of all places! And the United States knows more poignantly and powerfully than any as a result of the TWA hijacking and the suicidal bombings in Beirut, the nature of international terrorism. How can we deal with these things as individual and solitary countries? This is of course impossible. If ever there was an argument for a compelling multilateralism, this is it. The issue will emerge within the United Nations this fall. It has already emerged by way of a resolution put to the Nairobi World Conference of the Decade for Women by the United States just this week.

We are speaking of the recognition of the multilateral ethic. We are speaking of the realities of an international community which those beknighted protagonists of selfish nationalism cannot possibly disavow. It is terribly important that all of this be understood, be the concern of an educational curriculum, be part of those who are engaged in the work of teacher education. Multilateralism is indispensable to the sanity of humankind.

I want to end as I began, by saying how pleased and honored I am to be a participant in this, the First W. Clement Stone Lecture, to commend you in your work, to salute you for what you do, and to urge you ever onwards.

SECTION III

Education in the Information Age

Education in the Information Age
The Keynote Address

Jack R. Taub
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Many educators and policy makers have come to realize that the delivery of education must become more affordable and timely. All education, ranging from the training of our young to ongoing technical and professional training of adults, must move away from group lectures, from separate one-hour classes for each subject, and from the over-dependency on the textbook. Students now preparing for life must learn a new set of basic skills. They must be able to analyze and synthesize information, make judgments based on current data, and learn research skills that will make them autonomous, life-long learners. Nations need to train and then retrain again and again their adult populations to be more productive in today's interdependent world economy.

Educational technologies have two important values. First, technologies like radio and television are able to distribute information to large numbers of students cheaply. Second, computing technology allows the individual student to be interactive with certain knowledge through software programs.

However, the communication technologies now widely available to educators (radio, television, films, videotapes, computers) tend to embody only one of these values, but rarely both at once. For example, instructional television has yielded impressive savings in media delivery costs. Yet, television is limited primarily to "whole class" applications. Microcomputers, on the other hand, have demonstrated considerable value in individualized applications, but hardware costs remain relatively high as are the costs associated with courseware distribution.

Technology is opening up learning opportunities for large numbers of people throughout the world. Educators are gaining valuable experiences in using television, radio and other media to provide mass education. Now, new technological breakthroughs make it practical to deliver information rapidly and inexpensively to computing terminals where students can learn in an individualized, interactive, self-paced mode.

Technology is entering the classroom at an astonishing rate. As educators attempt to incorporate various technologies into the curriculum, they are confronted with an almost overwhelming number of problems, including:

1. the need for understanding current and potential applications of the technology;
2. the need to develop ways of evaluating, acquiring, and updating software;
3. the expenditure required to integrate technology into the classroom;
4. the need to integrate new and existing technologies;
5. the need to develop competency in utilizing new technology.

The fragmentary way in which computer products and certain media services have been placed in the schools in recent years has caused confusion and frustration. There is a growing anxiety among administrators and teachers that stand-alone microcomputers in the classroom are not delivering the instructional advantages promised by the hardware manufacturers.

The National Information Utilities Corporation

Recognizing this problem, the National Information Utilities Corporation (NIUC) anticipated that teachers and administrators would soon realize that the uncoordinated introduction of educational technologies into the classroom will not work to satisfactory levels of learning, productivity, and efficiency. NIUC set out to develop a cost effective system that integrates four major media components (computing, software, information, and telecommunications) with the various support services essential to exploiting fully their instructional potential.

The Education Utility (TM)

NIUC has developed the *Education Utility*(TM), an electronic management system, that is capable of providing almost instantly to educators and students located anywhere in the world, massive quantities of continually updated, instructionally interactive information (software programs, databases, graphics, news services, electronic journals, mail, and other instructional and administrative materials) at very low cost.

Educational benefits of the Education Utility(TM). NIUC believes that computers, when used in the media-integrating framework of the *Education Utility*(TM), will yield the following educational benefits:

1. self-paced interaction between the student and the knowledge to be learned;
2. relief from the rote aspects of teaching;

3. true customization of instruction for mainstream, gifted, vocational, handicapped, and other blocks of students of various ages and backgrounds;

4. infinitely patient presentation of information and tireless management of routine drillwork;

5. student control of contingencies and variables in simulated conditions;

6. real-time "windows on the world" through ready access to information available in electronic mail, databases, videotapes, and instructional television from around the globe;

7. hands-on experience with the basic tools of inquiry;

8. the means to locate, retrieve, manage and store the information products of the knowledge explosion;

9. efficient means to train and retrain teachers;

10. more efficient management of teacher and administrator workloads;

11. delivery of an individualized education that is fun, exciting and intellectually stimulating. NIUC's system will allow for any subject to be taught in any language in any location. The system can bring a world of information directly to each student.

Financial Benefits of the Education Utility (TM). NIUC has developed a way to deliver information on a mass scale in an affordable way. Educators and national educational systems will benefit from the many financial advantages afforded through the Education Utility(TM), which are:

1. low entry cost requirements;

2. single-source negotiating for the rights to distribute the best existing materials, with "bulk" savings being passed along to the subscribing school systems;

3. reduced computer costs through mass purchasing of terminals for entire states or districts;

4. cost-effective administrative support software that both small and large school systems can use to handle library indexing, financial accounting, budget management, testing, inventory control, career counseling, scheduling and attendance;

5. eliminattion of the need to buy and maintain expensive floppy drives and to reproduce and replace the plethora of floppy-disks by substituting a modest number of shared hard-disks;
6. reduced software publishers' marketing and distribution costs, thereby freeing up resources for the development of better programs;
7. billing for software on a usage basis, rather than purchasing program copies;
8. reduced school system costs of purchasing, storing and distributing textbooks;
9. integrated visual and digital technologies;
10. provision of electronic mail and communication from central offices to individual school buildings and classrooms throughout a system;
11. comprehensive "turn-key" services with a single, nearby contact point for efficient handling of all utilization, installation and maintenance problems.

Local Control of Educational Processes

NIUC is open to establishing local corporations or agencies in each state and nation using the Education Utility(TM) to allow for local input into and control over this worldwide electronic highway system.

NIUC is prepared to help educators take advantage of what has been learned to date about integrating technologies. For example, NIUC has designed technical specifications for its In-School Network. This means that more than one manufacturer will be able to help build the Education Utility(TM). NIUC's specifications can be made available to qualified hardware manufacturers. This will allow for regional manufacturing of certain hardware needed for the Education Utility(TM). NIUC also believes its specifications will set the standards for computer-related educational technologies. Thus, educators eventually will not be hampered by incompatible computers that are unable to communicate with each other.

The Education Utility(TM) also allows for input from multiple sites. Not only will nations and schools be able to insert their own materials into the Education Utility(TM), but they will be able to customize software and courseware packages to meet their particular cultural and language needs. For example, generic graphics for science simulations, visual dictionaries, and business tools will meet the educational needs of many countries. This will lead to significant savings, as only the text will need to be customized for use in Arabic, Spanish, Thai, or other languages.

Technical Services

NIUC is able to use the most effective telecommunications networks in each geographic area to deliver information on a national, regional or citywide scale. NIUC's technology digitally encodes information in ordinary types of broadcast signals. While broadcast signals carry music, news or educational documentaries, these signals also have a subcarrier component that allows for distribution of information simultaneously to computers. This means that users of the Education Utility(TM) will be able to receive continually updated educational materials like courseware, professional journals, or technical-training programs, at very high speeds tucked away in broadcast signals.

Additionally, users of the Education Utility(TM) will be able to transmit cheaply and quickly memos, directives, papers, and instructions among colleagues across the city or on another continent via broadcast signals.

Another service the Education Utility(TM) will provide is evaluation services prepared by various bureaus of education worldwide. These evaluations will help educators make informed selections of software and information.

Software Development

NIUC will obtain the rights to distribute and continually update educational software, textbooks, journals, and databases. Schools and universities can request from NIUC the specific materials that they want broadcasted directly to their own host computer.

NIUC recognizes the frustration many educators feel about the quality of software that is now available. We believe, however, that the Education Utility(TM) will stimulate the creation of better software in many languages by monitoring all usage so that fair royalty payments can be made to publishers.

Partnerships

More than a trillion dollars is being spent on education annually throughout the world. Despite the dominance and importance of education, there are no meaningful public/private partnerships currently committing the resources required to develop the new technologies, products, services, and training necessary to assist each nation in establishing an Education Utility(TM) that will be capable of providing its industry, educators, and students with immediate and long-term solutions to their ever changing and complex educational and professional training needs.

NIUC and AT&T have entered into a joint venture to design, market and install the Education Utility(TM) worldwide. After making an in-depth review of the vendors that were major participants in the computer marketplace, and consulting with educators, we selected AT&T. This selection was made for several very important reasons. AT&T is able to offer an architecture which deals with both the realities of today's market as well as with the educational needs of tomorrow. The unique combination of MS-DOS and UNIX in the hardware configuration, allows for the flexibility of using a great number of existing educational packages. And, the multi-tasking and multi-user aspects of UNIX insures an architecture for the future.

The open architecture of AT&T's systems is important to educators. It will be possible to port the Education Utility(TM) to new machines and avoid the problems of obsolescence. Last, but not least, AT&T and Bell Laboratories are committed to serving educators and administrators. They will deliver to educators what is needed, not what happens to be available.

Conclusion

The Education Utility(TM), by providing mass distribution of dynamic knowledge at affordable rates, while facilitating individualized learning on a genuinely customized and interactive basis, will cause fundamental and long awaited improvements in education.

Educators, however, will not be able to establish this new highway system to deliver information by themselves. The system we envision will require participation by government agencies, telecommunications firms, hardware manufacturers, higher education, elementary and secondary schools, financial institutions, commerce and industry.

The National Information Utilities Corporation has been invited to this conference to begin discussions with educational, government and business leaders on steps that need to be taken to establish the Education Utility(TM) worldwide.

The growth of knowledge based industries marks new challenges and opportunities for the commercial sectors of nations throughout the world to help directly in improving their nations' schools. International lending agencies are also expressing interest in the Education Utility(TM) as a means of delivering technical training on an ongoing basis. Cost effective access to such training is critical to nations wanting to stimulate economic development.

NIUC is prepared to help educators to get utilities operating in their respective countries. Major steps that need to be addressed by participants at this conference include the following.

1. Resources need to be identified and made available so that NIUC can assist nations with developing their plans for launching the Education Utility(TM) in their respective countries.

2. NIUC is willing to assist key leaders with mobilizing the resources to develop teacher and technical training materials and software programs to meet specific educational needs of various nations.

3. We need to work as true partners to establish Education Utility(TM) agencies in each country to respond to the particular needs of each country.

Just as dams have harnessed the powers of rivers to create electricity that allowed industry and agricultural crops to flourish where none existed before, the Education Utility(TM) will harness the power of the mind to meet the constantly emerging challenges of training teachers and other professionals, and allow them to keep abreast of changes in the sciences, mathematics, medicine, engineering, agriculture, and other topics.

The most important frontier of technology that the world's leaders need to address immediately is not millions of miles in outer space, but is located on the desks of students. A first step, taking advantage of the Education Utility(TM) to train teachers, will contribute towards building understanding among people worldwide, and move us into what I envision as the Age of Intelligence.

The Nature of Work and the Nature of Schooling:
New Responsibilities for Teacher Education in the Information Age

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Before I share my prepared address, I would like to make a few comments in the context of Jack Taub's keynote address. One of the interesting things about the relationship between humans and computers is that the more we use the power of the computer to study and analyse the workings of the human brain and nervous system, the more we realize that, while the human brain can compute, it is not a computer in the conventional linear digital sense. Recent research has shown that the human brain is fundamentally different from our mechanical computers. It is not simply a small, "wet," powerful, organic computer we carry in our skulls. For one thing, the human brain is not digital, because the rate of transmission of impulses varies, and this rate is a continuous variable. For another, the human nerve system exists in a set of electromagnetic fields. At one time these were thought to simply be an epiphenomenon of the operation of all those billions of neurons' separate electrical activities. Modern analytical techniques, however, reveal the fields to be non-randomly related (although we have not yet figured out exactly how they are related), and they mediate the activity of the neurons themselves. This is very different from the operation of any digital computer, parallel or serial in nature. So, strangely enough, our work with computers should make us all the more appreciative of our own wonderful capacities and potentials as a species. Far from diminishing human intelligence, computers should make us more aware of its enormous potential and power.

A few years ago, I came across a set of the magazine, Horizon. This magazine was dedicated to exploring the history of ideas in the arts and sciences. It was of a very high quality and was a failure in the subscription market because of the costly format. However, while it was published, it contained a number of fine articles by excellent writers. In one issue, I found an image which frequently returns to mind in discussions of social change, the impact of new technologies, and education. The issue contained a number of finely detailed line drawings by turn-of-the-century French illustrators concerning their separate visions of the year 2000. Given that they were produced in the year 1900, they are interesting and humorous, and they also illustrate a problem which people have in thinking about technological innovation. The particular illustration in question was entitled, "Education in the Year 2000." It showed a teacher with a class of students (all males as I recall). The classroom was typical of nineteenth century classrooms, with desks in rows and a rather austere looking general environment. However, there were some differences. For one thing, each student wore on his head a metallic cap connected by an overhead wire to a strange machine. The machine resembled a hopper, similar to a shredder for garden waste. Into it the teacher was dumping books on history, Latin, mathematics, and so on. Beside the machine, a weary looking drudge turned a large crank, apparently thus motivating the innards of the machine. The idea was that knowledge would be directly transferred from the books via the machine and its connections to the minds of the students.

Of course, this is an idea that has been projected from the imagination of more than one writer of science or science fiction in this century. But what struck me was not the wonderful or awful machine, but rather the fact that everything else (the class, the furniture, the schoolroom, the apparent relationship of the teacher to the students) was exactly the same as in the most traditional nineteenth century classroom. Is it not interesting that we so often think of major technological innovations in just that isolated, unconnected, disintegrated way? Thus, nuclear weapons are just bigger, more awesome, more powerful weapons capable of doing great damage. The idea that these weapons need to be seen as predicting changes in the entire structure of society is difficult for most people, but it is likely just as essential. The covers of old issues of Popular Mechanics are rich in illustrations of this type. Thus, the development of a personal backpack flying machine would be illustrated with a drawing of Dad going off to work, in a three piece suit with hat, kissing mom and the children goodbye at the door of a typical 1950's vintage suburban home. The idea that such an innovation in personal transport would precipitate major changes in the nature of society, including concepts of "work," housing, neighbourhood, sex roles, and so forth, was foreign. The point of all this is simply that humans are now, and I suspect always have been, in a coevolutionary relationship with their tools and inventions. Humankind with fire is not the same species as humankind without fire, and the use of technology feeds still other uses, creating new potentials, ideas and innovations which simply did not exist before the innovation. Sometimes it is very hard for individual humans or for social-political-economic institutions to realize this or to assimilate the full import of a new technology or set of technologies. Thus, I think that schools, and therefore agencies which support and surround schools such as teacher education institutions, have not yet begun to assimilate and understand at any deep level what the full potential for change is of computer technologies and of the synthesis of these tools in communications, assembly, design, resource use, art and music.

Ecosystematic thought is difficult for many people. We are taught to think in a straight line and to do one thing at a time, as if this were systematic thought. It is, unfortunately, anything but. Systematic thinking implies the ability to think holistically about connections among parts of a system in operation over time, a big order for most of us. Thus, the computer should not be seen in isolation. It is a "metatool," a tool which makes possible tooling and applications not possible without it. It causes changes which are often unexpected or unpredictable. For example, automatons that now are used to paint automobiles during assembly are much less wasteful of paint than are humans. As a consequence, the North American paint industry is feeling a slump in demand, as are the industries which supply paint components, such as zinc. The computer makes it possible to avoid having vast warehouse stockpiles of materials in case a big order arrives. Instead, production can be quickly adjusted, and on-hand stocks can be minimized. This means less use of warehouse space, and so on. We need to see the computer as part, perhaps the central part, of an entire new industrial revolution which will transform work itself.

But teachers are somewhat cynical and jaded about advocates who say that this or that new technology, approach or program will revolutionize schools. They have heard these cries before, and in some cases, the cries were truly "false alarms" or silly nonsense. When the motion picture camera and its support technologies was introduced, some people foresaw a "revolution" whereby the best teachers could be filmed and then projected into every classroom. The same sorts of forecasts attended the advent of television and especially the advent of small format videorecording and production.

The fact that neither television nor film projectors "replaced" teachers or became major components of schools misses the fact that both these media have changed schools, not directly, but indirectly, by changing the students who attend them. The students who come through the classroom door in the morning have a different view of the world, a different set of concepts, assumptions, and likely values, than did those before these truly mass media. Teachers, therefore, must deal with questions not previously asked, with issues never before raised, with ideas and assumptions not developed in school or by the family or community. In spite of years of research, we are still not fully aware of the impact of various media on children. Nevertheless, I contend that this is not because impact is lacking, but because it is so various. The importance of computers and information technology for schools and teacher education may not be so much from their direct impact on schools but rather from the changes they produce in the cultural context in which schools operate. If, for instance, the industrial era workplace of the factory and office disappears and the nature of work is changed in major ways, then schools cannot expect to be the same, even if not a single computer is ever used in a classroom. So, this morning I will try to deal not so much directly with the impact of computers on teacher education as with the nature of post-industrial society, hence the schools, hence the roles and needs of teachers.

The Workplace

In many western democracies, schools have been expected to perform at least four missions: personal development; interpersonal-social development (citizenship); academic intellectual development; and vocational preparation.(1) Thus, schools are not charged solely with vocational training, or even with indoctrination and socialization to the form and values of work. However, there are powerful expectations that schools will perform these functions. The point has frequently been made by contemporary analysts and critics of education that schools, especially high schools, mirror the industrial workplace.(2) The flow of activity, schedule demands, tasks and expectations, and teacher-student relationships all mimic many aspects of the industrial office or the industrial assembly line. If one reads reports such as the recent Report of the President's Commission in the U.S., A Nation at Risk, one is immediately confronted by the fact that public schools are seen as meeting the needs of the state for trained labour, skilled scientists and technologists, doctors, or whatever other form of worker is seen as being in short supply. Schools are also often placed at the focus of international economic competition, being seen as essential to success in the race for international markets. So it is important to remind ourselves about the nature of work in industrial society. (By the way, while some forms of work are definitely information-based now, others are still firmly industrial and, in many Third World countries, pre-industrial agrarian, craft, and guild work still predominate.)

Work in industrial society is often represented by the media as either overly attractive or overly depressing. Neither extreme is typically accurate. Nevertheless, it is worth noting certain features of much industrial work. Industrial work is often repetitive, disciplined, time structured, low in meaning, purpose or satisfaction, provides little opportunity for initiative or decision making, is machine paced, is often physically or emotionally demanding, requires few skills that are applied in a non-integrated fashion, is often very hierarchial, and is characterized by sharp divisions between managers, foremen, and workers.

It is important to note that the above list is very generalized. In recent years, more progressive management practices, coupled with the development of strong trade unions which can bargain aggressively about working conditions, have led to the development of some industrial work settings that are more humane, meaningful and satisfying. For some workers, moreover, work is simply a "necessary evil;" they work in order to earn money to meet their needs and to purchase recreation, a sense of accomplishment, or even a more healthy life-style outside the work setting. John Naisbitt sets the years 1956-57 as the critical period for industrial work in North America.(3) In that year, the number of blue collar workers engaged directly in manufacturing fell for the first time below the number of white collar workers engaged in processing information. But what Naisbitt fails to note is that although the industrial office may process paper-based information, it is still organized as an assembly line with each worker doing one small operation in the overall process. The real changes to post industrial work will come when humans are not used to perform routine, repetitive operations on either materials or paper. When that happens, human workers will begin to be used in work that can be performed only by humans, or that can best be done by them. Very few people have a clear idea about what these forms of work will be or about what skills they will require.

It has been estimated that work in the so-called "service sector" will become more important. This will include recreation and tourism (already projected as the fastest growing sector of the economy in many developed and lesser developed nations), medical services (important to an increasingly older population in the developed world), food services, the arts and fine hand crafts, consulting, information services and management, and professional work. What can be said about work in this sector is that it often has very few of the characteristics of industrial factory or office work.

The School

The school often mimics the routines and assembly line flow of industrial work. As an institution preparing and socializing the majority of students to this form of worklife, the public school has succeeded remarkably well. In the industrial school, especially the secondary school, teachers are the workers on an assembly line and the students, as units of production, pass through their work stations. The rotating-block timetable reflects industrial work. Both the teacher and the students have little sense of control over their work, and parents often feel equally powerless about what is being done. The curriculum reflects in large part the needs of industrial work. Hence, it contains a heavy emphasis on the basic skills of computation and literacy. In fact, must industrial work, whether in the office or on the factory floor, requires relatively little advanced skill in either computation or literacy, while industrial factory work also often needs little manual skill as well. The skills that are required are of a low level and often can be learned on the job in very little time. In jobs where the worker has to work in a team and to interact with other workers or with customers, interpersonal ability is sometimes valued by employers. However, while interpersonal skills may be learned in schools they were often not formally taught. In fact, many important life skills are learned on the playing field and in other settings as part of the "extra-curriculum."

The skills of the manager and those of the clerk-typist provide an interesting contrast in the goals of industrial schooling. The clerk-typist performs fairly routine, time-based, often repetitive work. Manual dexterity (typing skill) and the ability to read, although not necessarily to comprehend, are essential. The typist is actually a fairly skilled clerical worker, while the filing clerk is less so. The manager, on the other hand, is not expected to type, but is expected to be able to organize routines, supervise people, manage time, and, within certain limits depending on the level, to make decisions. Initiative may be desired. Discipline and analytical skills are valued. The ability to read and write are absolute requirements, but the ability to speak effectively and persuasively may be the most important determinant of success. Depending on whether information or people are managed, supervisory and therefore human relations skills are needed. The Industrial Age required a certain number of managers and any process of schooling which worked effectively had to create a situation whereby from 10 to 20 percent of the students would develop their skills to the managerial level, or at least to a point where they would be trained on the job to become managers. It is important to note that, prior to the widespread introduction of computers, many middle managers were essentially processors of information for more senior managers who actually made the decisions. Machines of post-industrial society can do much of the work done by humans in industrial society. The robot (or more accurately the automaton) can perform many low skilled, routine, and repetitive tasks requiring attention, speed, strength, and accuracy.

The computer can now perform many of the information management and processing tasks formerly performed by people. Schools no longer need to develop humans as robots, word-processors, or automatons. The growth of research in artificial intelligence suggests that even many fairly skilled forms of technical work (e.g., analysis of blood samples, of electroencephalographic data, and of electrocardiographic data), can be done by such systems. Middle managers are everywhere being replaced by computers and information systems which are used directly by top managers. As long as we had a fairly clear perception of industrial work, public schools as institutions which prepared and socialized the majority of students for that sort of work life, or for a life of personal service in the home, were not strongly criticized. But as our confidence in the future of work falters, so too can we expect that public schools will be questioned and attacked. This is precisely what is happening throughout much of the developed world. Morever, the students who are enrolled in them are expressing major concerns in two directions: whether there will be a future at all (that is, will there be a nuclear conflict) and, whether they will be able to find work. When adults and the young alike begin to doubt the efficacy of an institution such as the public schools then we will have to address a fundamental reshaping of the purposes and practices of schooling.

New Educative Forces

Goodlad has pointed out that the traditional triad of agencies concerned with education and socialization of the young include the family, the church and the school.(1) Often, these three were closely agreed about both their respective roles and about what youth needed. Today, there is no such agreement in most of the Western World with the result that the three agencies often are antagonistic to each other. In addition, the traditional trio has been joined by a powerful new member: the modern mass media.

We do not really know what the overall, long term effects of the mass media have been an educative force in society. The media themselves often want to shun any association with the world of education. They claim to present information or entertainment, not education. But, of course, they do not perform such a narrow range of functions. They expand the range of experience and provoke thought, often deliberately. As we have recently seen, they often help to create the news they report. Moreover, as long as conscious selections are made about what is presented, and in what format, the media cannot claim to be objective. To the pantheon of subjective goals shaping what the mass media do we must also admit educational purposes. However, even if the media had no educative purpose whatever, they have had an impact on schools, not by becoming major components of day-to-day instruction, but by changing the nature of the students who attend. These students are now aware of a far wider range of life-styles, problems, opportunities, and values than was previously the case. This is why authoritarian religions, political systems and corporations alike are so concerned about getting control over the mass media and about limiting access to satellite television or computer networks. In an information based society, information is the strategic resource.

We have heard already today that the computer as a stand-alone device is far less powerful than as an element of a global network of ideas and information. This is certainly true. The number of data bases and information utilities that are in use is expanding daily, and there is increasing need to have access to up-to-date information. It is, however, important to realize that private and government databases alike are created by human beings who exercise choice about the content, emphasis, detail and orientation of the information included. Databases, like newspapers, may have editorial policies which shape them. For many people, the computer is the icon of the Information Age. Surely, they believe, what comes through on the modem and is presented via the marvels of technology and electronics on the screen must be true? If the old adage not to believe everything one reads in the newspaper has validity, it is just as essential that people learn to think critically about the information presented through a computer, whether as a program or as an element of a database. Computer programs are works of authorship; they reflect the skill, experience, values, attitudes and intentions of their authors. A household finance program developed by an economist with one philosophy may be quite different in its direction than one developed by a person with a different orientation to money management. This diversity is useful and valuable, but only if computer users do not become so dazzled by the sophistication of the medium that they uncritically accept the message as truth. The need for critical thinking will be as great or greater in the information age as at any time before.

New Roles for Schools and New Challenges for Teachers

While the major goal seen by politicians and industrialists for public, compulsory schooling was the development of a workforce competent for industrial work, and attitudinally prepared to accept it, the nature of society itself changed as more and more people became able to read for themselves, to write their own thoughts, to speak their own ideas. Public schools, like any other technology, have a coevolutionary relationship to humans. So people began to expect and demand of schools more than mere job preparation. They demanded, and still demand, larger purposes: that schools (and therefore teachers) nurture the child and care about them as people.(1) They want the school to prepare people for a good life, but they disagree about what the good life is and about how the preparation should be performed. Nevertheless, Goodlad's work suggests clearly that parents, teachers, and students want four major missions to be accomplished:

1. the academic, intellectual mission;
2. the personal development mission;
3. the interpersonal, citizenship, cooperative mission (the student as a member of a community);
4. the vocational preparation mission.

What is especially interesting about this research is that even when probed further, the subjects were unwilling to see any of the other missions eliminated in favor of strengthening the academic mission. To be sure, parents will criticize schools if they do not perform academically, but they expect all four tasks to be performed. As we ask ourselves about the potential instructional role of computer and communications technology, let us also ask which of these four missions the computer might serve best, and in which of these missions human teachers can excel.

To a very real extent public schools have been made to play a game they can not win, thus forcing them to neglect those things that they can and should do well. The game they can not win in a world of mass media, computers, communications technologies, and exponentially growing information, is that of acting as conduits of information into the heads of students. There is a game currently popular in North America called "Trivial Pursuit." People compete to remember isolated, often highly obscure facts about past events, personalities, geography, and so on. Neither synthetical nor analytical thinking are required to any great degree. Recall is emphasized. Unfortunately many people equate success at such a game with the possession of a quality education or of great intelligence. If schools pour in masses of facts which are then accounted for by equally trivial recall-based, machine-scored, standardized tests, then surely this is what is desirable.

Unfortunately, the modern world is rich in information but often impoverished in knowledge, meaning, and wisdom, the latter manifested in the ability to use information wisely and effectively, to discard what is of poor quality or which is flawed or inappropriate. Computers and communications technologies provide us with ready access to mountains of data or information. But once we have it, what will we do with it? Modern life is certainly more challenging than a game of Trivial Pursuit. The development of students' abilities to synthesize, to analyse, to criticize, to question, to evaluate information is precisely what human teachers, interacting effectively and engagingly with students, can do best and far better than any machine. This takes sustained, engaged contact between students and teachers, and this is precisely what industrial models of school operation impede. Let us stop using human teachers to perform roles far better taken on by modern technologies, but let us also create patterns of schooling which facilitate the "high touch" elements of education which are desparately needed and which can best be done by humans. In the division between high tech and high touch described by Naisbitt,(3) I would place schools clearly on the high touch, human side of the ledger.

There are other challenges to post-industrial schooling as well. There is a very real danger that the rise of the use of personal computers can create yet a new set of "haves" and "have-nots" in society. While the middle and upper classes can afford to purchase computers and software and to connect these to information systems, many other people in society cannot afford this in spite of the rapid fall in computer costs. At least in the near future, schools should be places where people of all ages can gain access to computers and to information services. The schools' computers, however few of them there may be, should be in constant use, night and day, seven days a week. The school should act as a catalyst in the community encouraging all its members to gain familiarity with the machines and with their uses, strengths and weaknesses. In the process of extending their services in this fashion, public schools can meet yet another critical modern challenge to their functioning and existence.

It is news to no one in this assembly that the demographic composition of the Western World has changed markedly in the past 15 years. The developed world is becoming an old world, a world where proportionately fewer people are young and where more and more are over fifty. Robert Preston in his 1984 paper, "The Fate of the Young and the Elderly in the U.S.," notes some of the consequences of this shift.(4) Whereas prior to the mid 1960's the old fared comparatively less well than the young in income, life expectancy, suicide rate and general life satisfaction, this pattern has reversed in recent years with those 25 and younger experiencing more poverty, higher suicide rates, more unemployment, and generally lower satisfaction with life. Politicians, especially those who think in the short term, are not likely to miss the fact that the principal service provided to the young has been education while that to the old has been health care. Given further the political power of the older citizen, politicians are quite likely to play the needs of the old against those of the young, especially in times of recession. Precisely this approach has been used in British Columbia in the past year. The tragedy of this strategy is that it deprives both the young and the old because it is now reasonably well established that older people who remain active learners, who stay engaged mentally and physically, also stay healthier, live longer, and are less likely to require long term chronic care. But public schools have allowed themselves to be seen as a service only to the young, and in fact our society still largely subscribes to the dysfunctional idea that education, especially schooling, is preparation, which is then followed by a work-life, and subsequently retirement. However, this pattern is eroding, and more and more people must be retrained and want to continue to learn and to work throughout life. By offering access to computers for entire communities, public schools may be able to extend their mandate to become community resources in supporting the lifelong learning of all people. But if they do not open their doors and extend their range of operation they will be very susceptible to political isolation and to massive contraction in support.

Implications for Teacher Education

From what has been said so far it is obvious that I believe that public educational institutions have to be reshaped to meet the new patterns of work and recreation of a post-industrial era. In many ways, what is needed is a return to a clear focus on developing fully competent human beings rather than supplying human raw material to the industrial state. Rapid change will require people able to adapt, to shape change as well as merely respond to it. The flood of information coupled with new technologies means a need for better critical and analytical thinking. At the same time, new and unique problems will require the full scope of human creativity and wisdom. Thus, teacher education has several broad challenges:

1. Teachers must be fluent with new computer information technologies, not as programmers, but certainly as informed, wise, and critical users with a knowledge of the potentials of these systems.

2. Teachers need a broadly based education so that they can assess changes and innovations from more than a single, specialized position or perspective. They need to have good skills in information access and evaluation.

3. Teachers need strong competence in their ability to help learners of all ages to think critically and reflectively, and to mediate the meaning of innovations, technology, and ideas in their lives. They need to be able to help people develop the full range of their capacities as life-long learners.

4. Teachers need to be committed to their own constant education and learning and to see this as a lifetime requirement of their profession.

5. Teachers need to see themselves as designers of instructional systems, whether electronic or more traditional. They need to see teaching as a creative, expressive act, which requires certain technical skills but which is not complete only as such.

6. Teachers need to be skilled communicators with their students, with their peers, with parents, and with members of the community at large. They need to be committed to the process of ongoing communication about and in the learning process.

For current colleges and schools of teacher education, there is a clear challenge and opportunity in such a set of teacher characteristics. Parts of these are fostered by many existing programs, but unfortunately, the parts are all too often never assembled into a whole, workable system, or even seen as having the potential for such assembly. Furthermore, most Faculties of Education are essentially "faculties of public schooling." In that sense, they basically prepare teachers and continue their education to teach in the institution of public schools as we have known them. The real challenge, however, is to educate teachers who, with their communities, can re-invent the institution of public education, extending its mandates to incorporate the requirements of the post-industrial era.

The time in which we live is such that it requires human beings to demonstrate the maximum available compassion, wisdom, creativity, effort, and discipline. Programs of education, whether for teachers or for students, are challenged to systematically and consistently empower the expression of these ultimately human traits and potentials. Without them, the technology will be meaningless, and may well precipitate our destruction. Improving the schools as they are and as they have been will not suffice. We must change schools. We must invent new ways of attending as a society to the educational needs of all in the changing world in which we live. To do otherwise is too dangerous. I close with a quotation from Loren Eiseley:

> . . . The need is not merely for more brains. The need is now for a gentler, more tolerant people than those who won for us against the ice, the tiger, and the bear. The hand that hefted the ax, out of some old blind allegiance to the past, fondles the machine gun as lovingly. It is a habit man will have to break to survive, but the roots go very deep...He has always sought mastery over the materials of his environment...he holds the heat of suns within his hands and threatens with it both the lives and happiness of his unborn descendants. Man, in the words of one astute biologist, is 'caught in a physiological trap and faced with the problem of escaping from his own ingenuity.'(5)

That seems to me to be a pretty appropriate summation of the challenges for teacher education in an Information Age, or in any other.

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Using Technology in Teaching
Panelist's Comments

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The past decade has seen a dramatic growth in the development of computer applications for teaching and learning. It was about 1975 that the first Apple microcomputer was constructed by two young men in a family garage in California. While there were already several other makes of relatively low-cost microcomputers on the market, the Apple seems to have triggered the major entry of small computers into the schools of North America. Prior to the microcomputer, only senior secondary schools had regular access to computers, and this was most often through terminal connections to a central system in the school board offices, or in a nearby college or university. Suddenly, the low cost of microcomputers permitted their purchase for home use as well as for schools.

It should be recognized that this rapid entry of computer technology into elementary and junior secondary education placed an immediate strain on those teachers without previous computer training, the vast majority. In most schools, it fell to a few computer enthusiasts to lead the way into this uncertain environment, and many did so with evangelical fervor. Colleges, universities, and local educational authorities have since entered the field by offering preservice and inservice opportunities for teachers to learn the many ways in which computers can be used effectively in the school classroom. Among the useful applications of computers to the classroom are the following.

> Drill and practice routines permit the learner to respond to an unlimited number of presentations of questions which focus on basic learning skills such as arithmetic, language vocabulary, geographical names, and the like. This is considered to be the simplest level of Computer Assisted Instruction (CAI), and is most frequently used for the purposes of assisting slow learners to acquire the necessary skills.
>
> Tutorials are useful for initial learning of a broad range of concepts. Research evidence indicates that students can learn at least as effectively through a well-designed tutorial as in the traditional classroom, but can do so in as little as half the time. The development of tutorial software has been hindered until recently by the memory capacities of microcomputers, but this is rapidly changing. We can look toward steady increases in the use of tutorial CAI at all levels of education.

Simulations involve the representation of various processes and events on the computer. Scientific experiments, historical events, economic systems, and many others can be "realistically" modelled by computer programs. Many learning experiences can be provided to students that would otherwise be virtually impossible.

Computer games are often very useful simulations for the development of logical thought and psychomotor skills. While overindulgence in games is certainly undesirable, their appropriate use can provide important learning experiences for most children.

Problem solving with computers is emerging as a very important extension to basic skills development, particularly in mathematics, but in other subjects as well. LOGO and BASIC are the two computer languages most frequently used to permit students to test out strategies or algorithms for the solution of a wide range of meaningful problems.

Word processing has become a powerful tool particularly for teachers of the language arts and creative writing. The process of producing hand written drafts no longer slows the flow of ideas, since modications to the original can be made easily and quickly within the computer's memory, and then printed out with consistent good quality.

Database programs are being used increasingly to permit students to conduct "research" in many areas of study. Historical, economic, sociological, and other types of information can be searched very easily for any number of characteristics. Reports, then, are based on a systematic body of information. Thus, even the elementary school student is able to acquire research skills similar to those employed by professional researchers.

Electronic blackboards allow the teacher to prepare learning materials on the computer and then to present them to the class as a whole by means of one or more large television screens. In this manner, the teacher is able to demonstrate complex concepts in a very precise and methodical way. When the emerging videodisc technology is added to the electronic blackboard, an even greater range of learning experiences can be provided. We can predict that classrooms of the future will be designed to include computers, videodiscs, and large display panels.

The fifth generation of computers now under development is intended to create universal computer-based information systems. Virtually the sum of human knowledge will be available, at a price, from these huge computer utilities. Those who have access to this knowledge base will be placed in a much preferred position to those without.

Educators, therefore, must act to master and use this powerful tool, both to improve the processes of teaching and learning and, also, to insure that it will be available for the benefit of all. This is the major challenge to the field of education as we consider technology in the Information Age.

Planning a School System Central Office Computer System
Panelist's Comments

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There is no question that in the past decade computers have become an influence that pervades many aspects of everyday life. The marvelous magic of the computer is everywhere and sorrowfully so is some of the witchcraft. Basic to the determination of the type of magic which one experiences is the ways in which hardware, software and people are blended.

This paper presents a case study of planning and implementation associated with the installation of a computer in a school system. Objectives of this undertaking were to bring out and synthesize the best thinking of the individuals involved, and to develop recommendations for future direction.

Context of the Study

Charles County, Maryland, is a rapidly growing county situated within one hour's drive from both the City of Washington, D.C., and the University of Maryland. The County's public schools serve approximately 17,000 students. The County also supports a Teacher Education Center and a Community College, each within a few miles of the County Board of Education's new central office building. All of these educational agencies are subject to the governance and enjoy the resources of the Maryland State Department of Education located in Baltimore, Maryland. Representatives of these agencies meet regularly to plan collaboratively preservice education, inservice education, and efforts in evaluation and research.

Two years ago, a plan was created to develop the technological linking of twenty-seven schools, the departments comprising the central administration, and other entities such as the University of Maryland, the University of Maryland Education Center, the Charles County Community College, and the Maryland State Department of Education.

A minicomputer was installed one year ago to serve as the primary computing facility for the school system. A recently developed software package was installed to meet administrative and accounting functions, and terminals were placed in each middle and high school. Terminals will be placed in elementary schools later this year. Locally, our expectations of what computers could do for education included the provision of vast networking capabilities as well as relief from the many labor-intensive counting, monitoring, and logistical tasks of public education. The hopes were that these and other benefits would be derived with a few simple computer commands, and that educators would be freed to focus on the analytical and intellectual aspects of their profession.

Problems Encountered

Much has been learned about what can go wrong: students' report cards were late each semester; tax reporting forms were late; an inadvertent break-in resulted in "promoting" all 17,000 students. These, however, are merely programming and operating problems. We have experienced more substantive problems as well: there is a design limitation that impedes the manipulation of data and discourages exploratory research; there were inadequate plans for electrical power and physical space resulting in reduced system efficiency.

Why did these errors occur? Woodridge and London claim that a failure in data processing systems will fall under one of three headings: "failure to set firm objectives at the start; failure to involve the user from the start; too much concern with the computer and not enough with people."(6)

A Search for Solutions

In order to obtain some answers to this question, we interviewed six teachers, eight principals, eight supervisors, nine directors, two assistant superintendents, two secretaries, and the superintendent concerning their attitudes toward the computer system. The questions in the interview were intended to determine perceptions of involvement in decision making, perceived value of services, and ideas concerning directions for the future. The findings reported below are organized according to these three areas.

Involvement in Decision Making. The superintendent and those closest to the operation of the computer system recognized the direct involvement which they have had in its development. This feeling seemed to be less among persons who were farther removed from system operations. Although a steering committee had developed a plan that pointed out the need for involvement of the various types of users from within the school system, the impression was expressed that a great deal more could have been done to assure the desired level of participation. Respondents suggested that this may have been done if leaders of the various user subgroups had received training in participatory management processes.

Value of Services. Interviewees felt they had not yet been helped directly by the computer, but they felt also that the work that had been done held promise, and that soon more things would be done better, more quickly, and with less effort. Central office staff tended to value the ease of capturing and recording data and the accessibility of student attendance data. School staff, however, were not yet willing to trust the computer in this matter; many were continuing to use their paper record keeping system in parallel with the computer service.

The majority of individuals who were interviewed reported experiences in which they felt that the computer system had failed in some way. Several indicated a concern for the accuracy of reports, but recognized also that this was improving.

Users reported "feeling more confident" about the accuracy of reports, and "becoming more familiar" with the new system. Interviewees indicated disappointment, however, at finding that certain jobs were not being accomplished by the computer. (Most of these jobs, for example, bus routing and scheduling, will be performed by the computer system in the future.)

Some respondents reported that they had been pleasantly surprised to find that some tasks were being performed by the computer. Examples of these tasks are obtaining quickly various types of listings, providing report card labels, and generating plant and equipment amortization schedules. Most respondents, however, reported no surprise since they knew what a computer system could do. A concern was expressed by top level management for the lack of software to accommodate the variety of needs in educational management. The lack of adequate software documentation was also identified as a key concern by top level users.

Directions for the Future. The interviewees' responses about the future and about the promise that the computer holds for the enhancement of education were characterized by a sense of excited anticipation.

When asked to consider what action they would take if they were responsible for the management of the computer system, interviewees expressed a wide range of activities to perform diverse tasks quickly and accurately. The desire for increased access to the computer with shorter waiting time was frequently expressed by respondents in all roles. The reorganization of functions in the daytime (active management) and nighttime (routine system management) and the addition of an eight hour shift was recommended.

Several respondents stated that the time had come to revisit the various user groups in order to reaffirm the appropriateness of functions and to determine future directions. Nearly everyone expressed the belief that immediate and comprehensive training was a critical need.

Recommendations

The recommendations of this study are presented in four parts, dealing respectively with planning, implementation, training, and evaluation.

Planning.

1. Full realization of the potential of a computer system requires a comprehensive training plan.

2. From the very beginning the people who will use the computer system must be intimately involved in the process of specifying and selecting the system.

3. The planning process must enjoy adequate time for organization, study, implementation and evaluation.

4. Involvement must take place both vertically and horizontally in the organizational structure of the school system.

5. Expert technical guidance is critical to planning.

6. Planning should require that the hardware and software allow flexibility in the manipulation of student data.

7. Teachers and support staff must be included in the planning process.

8. Periodic "computer installation briefings" should be prepared and distributed to personnel in order to maintain awareness and involvement.

Implementation.

1. Implementation should be performed in stages: pilot testing, evaluation of results, modification, reevaluation, remodification, and implementation.

2. While competence is being developed, a parallel system should be maintained until the success of the endeavor is determined.

Training.

1. Training is essential to establishing competence.

2. Training must be designed according to the tenets of adult learning, involvement, and commitment.

3. Training must be consistent, relevant and non-threatening at each level of the organization.

4. Training should be tailored to the various role groups which comprise the organization. For example, office staff need to know how to perform different tasks such as changing tapes and disks, collecting data, entering data, issuing commands and so on. On the other hand, leadership staff need to know more about planning and participatory management with regard to the development of the system.

5. Training should develop a clear understanding of the limitations of a computer system.

Evaluation.

1. Periodic opportunities should be provided to determine progress, direction and needed modification of the computer system involving all user groups.
2. Periodic check points should be arranged to monitor and assess progress.

Conclusions

The results of this study confirmed a widely held view that special attention must be paid to person-machine interactions. A computer system must be viewed as part of a larger, human system. Its success must be measured in terms of the services that it provides. If a computer system is to be useful, its characteristics must be defined according to the needs of the people it is to serve. Further, people must be prepared to accept a computer system designed to meet their needs. Success seems to lie in using the best thinking of the potential users and in bridging these ideas to the technology.

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Technology in the Information Age: Extending the Possibilities in Teacher Education and Teaching

Panelist's Comments

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Over the last few days, most of our speakers have been talking about technology. I want to come back home to basics. For most of you in the advanced societies, computers are a thing of the present; for most of us they are a thing of the future. What I have to share with you this afternoon are some of the things that we have been doing in education in what you would refer to as a developing country.

Many people confuse Liberia with Nigeria or Libya. Liberia is a small West African country with a population of about two million people and an area of about 43,000 square miles. Liberia has ties with the United States going back to 1816, when the American Colonization Society decided to repatriate freed slaves from America. Liberia was the only tract of land in Africa that was not preoccupied by the Germans, English or French during the colonial days. The capital city of Monrovia is named for James Monroe who was the American president at the time of the emancipation of slaves to Africa.

The country has been slow in developing. Education is a relatively new phenomenon. Public education was established in 1917, when the act was passed to create what is now the Ministry of Education. Before 1917, the work of education was left to the mission schools. Up until 1963, there were very few elementary schools in Liberia. The reason is that the founding fathers did not think that education was really that important. So by the late 1950's and early 1960's, we were just beginning to build elementary schools throughout the country. There are two institutions of higher education, the University of Liberia, which came into being in 1954, and Cuttington University College, which is a mission school supported by government.

Our Ministry of Education is responsible for all educational policies in the country. We now have some 380,000 students from elementary through high school. We have some 1,000 elementary schools, and about 12,000 public school teachers. Interestingly, one-third of the entire civil service works for the Ministry of Education.

Everybody wants to go to school, and we are trying to develop facilities for all of our citizens. Unfortunately, we are trying to do this at a time when money is difficult to come by. We have been engaged in projects through the World Bank, the International Monetary Fund and the United States Agency for International Development.

One project that I want to mention is the Improved Efficiency of Learning Project, which is intended to provide inservice training to teachers for the Liberian schools. Many of our teachers are under- or unqualified, and the project responds to this problem. Our project is modelled after that done in the Phillipines. We looked at the Phillipine model, and we redefined it to fit into the existing conditions in Liberia. That was in 1978. We were fortunate to have USAID support for the project. We are trying to develop our own instructional materials. We use programmed learning for instruction of inservice teachers. The imported textbooks that we have are old and not culturally relevant. Some illustrate things like snowcapped mountains; in Liberia the average temperature is 90 degress year round. We are trying to write textbooks that reflect our culture. Since the project started in 1978, we have devised our own models, have had a semievaluation done, and the project is proving viable for training teachers or upgrading the teachers that we have in the primary schools. The success of that project has led to a six-year extension, to be funded again by USAID. Teacher quality has improved. In our textbook development work, we have written the first four grade levels in mathematics, science and language arts. We were fortunate to have MacMillan do the publishing for us.

With respect to the computer age, computers are a new phenomenon to us. I discovered when I went back to Liberia in 1978, after my graduate work in the U.S., that there were no computers. Data was stored and retrieved manually in the Ministry of Education. So, since 1978, I had been trying to purchase the first government computer in the country, and I succeeded two years ago. We purchased a Wang machine that we now use for data aggregation and analysis. The Ministry of Finance, the Bureau of the Budget and the Ministry of Planning followed suit. We now have about nine pieces of equipment in the country.

We have started putting our programmed learning models on the computer for easier modification and dissemination. We have students in western universities learning the techniques and applications of computers. We are using computers at the ministries and at the University, but we are offering computer courses for students who do not have the necessary background. But we are working our way up. We are helping our fellow citizens to become literate in every way.

ABSTRACTS
OF CONCURRENT SESSION PRESENTATIONS

The Application of Technology to Educational Problems

New Prospects and Challenges in Teacher Education in the Age of Information Technology (Aho, Leena, University of Joensuu, Finland) SP026749

This paper underlines the need for training teacher educators and developing readiness that will enable them to adapt the benefits of information technology for use in teacher education and related research. Information technology and its challenges for teacher education are examined, as far as the student is concerned, from two points of view: first, how will computers with statistical programs, word processing capacities and graphics benefit the student's own studies or enable the student to understand things at a deeper level; second, what kind of knowledge and which skills will the prospective educators need to be able to adapt information technology for use at the various levels of school. The paper focuses on how, by developing educational research and teacher education, it is possible to involve in education the positive, developing aspects of information technology. It is pointed out that teachers and teacher educators should have up-to-date knowledge and skills, initiative, creativity, and ideas to develop pedagogy that will meet the demands of the times in a positive way.

The Challenge of Evolutionary Learning (Banathy, Bela H., Far West Laboratory for Educational Research and Development, San Francisco, California, U.S.A.) SP026752

Emerging educational needs in the interdependent world of the Information Age are explored. The current global human predicament in the historical context of the evolution of human systems is examined. A description is given of a systems view of the current evolutionary stage and the new educational needs of the Information Age that can be derived from an understanding of the evolutionary transformation currently taking place. It is emphasized that in the Information Age, the central challenge of education is to develop evolutionary competence in people and in societal groups (from local to global) which will give direction to human evolution. Evolutionary competence is characterized in terms of knowledge, understandings, ways of thinking, skill, dispositions and values. A curriculum model is displayed that is relevant to evolutionary competencies. Instructional and learning arrangements and resources are defined that can enable the development of these evolutionary competencies. Three types of learning are considered: socially supported individual learning, social learning, and societal learning.

Teacher Computer Literacy Training in the Rural Southwest: Approaches Tried and Lessons Learned (Black, Barbara A., Eastern New Mexico University, Portales, New Mexico, U.S.A.)

Eastern New Mexico University, with limited resources, has attempted to provide computer literacy training for inservice and preservice teachers in the rural Southwest. This case study includes the methods employed by the University to meet the computer literacy needs of inservice educators: preparing individuals in certain school systems to offer their own inservice sessions; bringing groups of educators to campus for initial hands-on sessions; offering a telecollege course which combines at-home viewing of on-campus sessions; aiding school system personnel in designing off-campus, credit courses to be taught by teachers in the system; sending a faculty member from the School of Education to the schools to provide inservice training; holding a conference on campus which offers an overview of educational computing. Methods used in degree programs are also described, along with obstacles encountered and lessons learned.

Microcomputer Adoption and Program Implementation: Change Models and Change Agents (Bond, Eldon A. and Arthur H. Himmler, Washington State University, Pullman, Washington, U.S.A.) SP026768

A field study was designed to explore the processes involved with the assimilation of computers into the K-12 instructional program in the State of Washington. The study examined patterns of microcomputer adoption and implementation in both rural and urban school districts. Specific research objectives were to describe actual computer adoption processes, actual computer implementation processes, and the relationship of these two processes to theoretical models of educational innovation. Three theoretical models of the innovation process were examined: research, development, and dissemination model; social interaction model; and problem solving model. Two important findings were that educators were more concerned with the feasibility of the innovation than with its potential for improvement of instruction and that the implementation process itself tended to change the innovation. While the theoretical models were useful in understanding the change process, the models were more normative than descriptive. The authors conclude by proposing seven additional research hypotheses for future research.

Technology in Preparing Teachers for an Information Age (Bright, Larry K., Terrie M. Shannon, Helen L. Carlson, and Eugene E. Grossman, University of Minnesota, Duluth, Minnesota, U.S.A.) SP026613

Teacher education can be effectively transformed to prepare educators for the Information Age. The characteristics of the Information Age require the application of organization development processes and interactive learning technologies which bring the best results of behavioral and engineering sciences to refocus teacher education structures and methods of instruction. Two applications of science have profound implications when applied together in a process for change. The first (Organization Development Process) has grown from four decades of human behavioral research on the improvement of the structure and leadership of organizational behavior to produce significant growth in interdependent goal behavior. The second (Interactive Videodisc Teaching) has resulted from engineering research which has achieved the capability to retain the human dimension in interactive videodisc software through linkage of the computer, video, audio and instructional design. This paper reports the features of the change process, research results on formative change, and implications for American and international education.

A Curriculum Model for Integrating Educational Media in Teacher Education (Carl, Arend E., University of Stellenbosch, Republic of South Africa)

A curriculum model for integrating educational media in teacher education is described. The program is being implemented in the Republic of South Africa. Five areas are the focus of this paper: (1) the role of the training institution; (2) teacher training in the Republic of South Africa and the accommodation of educational media; (3) curriculum development and the integration of educational media; (4) a proposed model for integrating media education in teacher training at the University of Stellembosch; and (5) demonstration of a few products resulting from the implementation of the proposed model.

Standing Guard: Maintaining Educational Balance in the Information Age (Carr, John C., University of Maryland, College Park, Maryland, U.S.A.)

This presentation raises issues and concerns in terms of educational use of information technology. Questions are raised for teachers and teacher educators to consider as they confront the increasing amount of technology rising from the Information Age and the changes in schooling that are the result of the use of the new technology. Educational personnel must be careful to maintain a balance in educating heads and hearts. Education must not become mechanistic, vocation oriented, or narrow in the knowledge, alternatives and aspirations it provides youth. Future needs in terms of curriculum requirements, and preservice and inservice teacher education are discussed.

Computer Assisted Instruction in Teacher Education: A Full Length Course (Cartwright, Phillip G., The Pennsylvania State University, University Park, Pennsylvania, U.S.A.) SP026770

Pennsylvania State University has developed, evaluated, and implemented a series of modules and an entire three-credit teacher education course which is offered completely by microcomputer. The course is entitled "Educating Special Learners". The modules use the Apple II series and the IBM PC series. Evaluation of the course, based on three criteria--cost efficiency, academic achievement, and student acceptance--indicate that the program meets all goals of the teacher education program. In addition, the course has been used successfully at the University for the past two and one-half years. Approximately 48 institutions in the United States and Canada are already using this course or plan to implement it into their teacher education programs. A description is given of the course, and diagrams of the computer programming process are included.

Teacher Education and the World of Technology: Ideals and Reality (Chik, Azman Wan, University of Malaya, Kuala Lumpur, Malaysia) SP026755

The impact of world technology on the Malaysian education scene has been tremendous. The system of education, while trying to maintain its local cultural values is greatly influenced by the world culture. This phenomena is also seen in its teacher education programs. But what has this impact done to the development and progress of teacher education in the country? This paper highlights: (1) Teacher education programs in the country at the perservice and inservice level; (2) How much technology has influenced the education of teachers to be more effective in the classroom and achieve excellence in their performance; (3) The impact of world technology on the value-system of the country in direct relation to the goals of teacher education; and (4) The Malaysian classroom in perspective: realities and possibilities. In looking at the impact of world technology, especially technological aids to improve teaching and learning, we must be aware of: (1) the cost benefits of such aids; (2) the role of the "super-salesman"; and (3) the training of teachers to cope with the changing world of technology. This paper draws conclusions for studies made in the country on the above possibilities and suggests areas for further rethinking, research and planning.

Learning Systems: A New Paradigm for the Information Age (Forsythe, Kathleen, Learning Systems Knowledge Network, Victoria, British Columbia, Canada)

The powerful potential of new information technologies calls into question models of education derived from the industrial era of the nineteenth century and the advent of public schooling. Telecommunications using satellite, cable and fiber optics technology offers the means to connect people and information, to dissolve distance and to promote interactivity. However, there may be human relationships that are fundamental to human learning. In order to preserve these uniquely human qualities while seizing the new opportunities presented by technology, we need a new framework to order our relationships. This new set of concepts may actually indicate a paradigm shift in both the locus and focus of education from school to learning center, from knowledge to learning, from class to individual.

Reflections in the Electronic Window: Video Technology Options in Education (Haughey, Margaret and Arlene Zuckernick, University of Victoria, British Columbia, Canada)

The use of television in the classroom as an instructional aid to the teacher has in large part been a failure despite the massive expenditure of funds involved: it has not become the great new innovation. Today, television is accepted as a cultural artifact, and its use in home and school is commonplace in the developed countries. Video technology has developed to the point where it is feasible to apply various learning environments and conditions. It offers an option for those students who are unable to come to campus to study. Whether because of geographic distance, economic necessity, personal lifestyle convenience, disabilities or preferred choice, many professionals do not return to the campus for continuing professional training. For this group, video technology provides a number of possible applications which are shown and discussed. The reflections in the electronic window multiply and change. Video technology has come of age in education.

Using a Statewide Microcomputer Educational Network to Enhance Teacher Education (Hobar, Nicholas, West Virginia Department of Education, Charleston, West Virginia, U.S.A.) SP026781

A description is given of the West Virginia Microcomputer Educational Network in the context of excellence in education and how it enables educators in schools, colleges and the State Department of Education to access and input to an information base of research findings, successful practices, and operational programs related to curriculum, evaluation, instruction, and teacher training, including adaptations for exceptional students. The master plan calls for the development and implementation of public school curriculum and teacher education programs based upon learning outcomes. The network provides educators with free, state-licensed software for word processing, electronic spreadsheets, data base management and interactive authoring in addition to approximately 2,000 public domain software packages. A key feature of the network is the capacity of communications between the various sites within the network. The network has the capacity to disseminate public school educational programs, teacher education programs, and training materials to every teacher and teacher educator in the state.

Computer Technology in the Educational Setting: The Role of Administrators in the Innovation Decision Process (Jorde, Paula, National College of Education, Evanston, Illinois, U.S.A.) SP026789

This paper examines some of the theoretical and practical issues confronting educational administrators who must make decisions regarding the implementation of microcomputers in their schools. A conceptual framework is offered for understanding the stages involved in the innovation decision process. Several attributes of innovations are discussed and the objective and subjective judgements involved in any decision to adopt new educational practices are considered. Among the factors involved in decisions about introducing microcomputers are cost effectiveness, social approval, complexity, efficiency, and compatibility with current practices. The nature of adoption and rejection decisions are briefly discussed. Finally, some factors influencing adoption decisions as well as unanticipated consequences of adopting computer technology in the educational setting are examined. One such issue, for example, is the physical and psychological consequences of prolonged computer use and the stress involved in interacting with electronic media over an extended period of time.

Enhancing Educational Opportunity Using New Technology (Kissock, Craig, University of Minnesota, Morris, Minnesota, U.S.A.) SP026774

A new project, designed by educators in Minnesota, will develop, evaluate and disseminate model procedures for integrating new information and communications technologies into precollege instruction in rural areas. Consortia of small rural schools using interactive telecommunications will serve as pilot sites for developing and assessing the effectiveness of different models. A motor coach supplied with information and communications technology equipment will serve as a portable classroom and demonstration site. It will offer educators access to new technologies so their value in achieving goals of instruction can be assessed. A presentation is made of the premises, intended outcomes, decision making processes and activities of a project to guide educators in determining the appropriate use of new information and communications technologies to achieve goals, enhance quality and provide equal educational opportunity for precollege students in rural areas.

The Use of Computer Interactive Videotapes to Train Educators in Remote and Rural Locations (Leonard, Leo and Dvenna Duncan, University of Portland, Oregon, U.S.A.)

A program developed by the University of Portland for the inservice education of rural area teachers in remote places is discussed. The program uses computer interactive videotapes which contain the latest in content knowledge and teaching methods and research. Computer programs are written which will interface with the videotape, and the complete package is sent to the rural area. Teachers complete the package and return it to the university. Their answers to that package guide the development of the next package to be sent. Training materials are personalized according to the needs of the area and the individual.

Video-Recorded Microteaching Situations and Their Contribution Towards the Preservice Professional Training of Student Teachers for the Secondary School (Louw, W. J., University of Pretoria, South Africa)

Students in the Faculty of Education at the University of Pretoria have their student teaching performance assessed through the use of video-recorded microteaching situations. Three sources of video-teaching situations are used in the training of student teachers: (1) while teaching specific high school subjects; (2) senior teachers in their high school classes; and (3) while microteaching high school pupils or a group of peers. Along with the recording, student teachers submit a self assessment of their teaching performance, students' assessment of the classroom experience, and information regarding classroom context. The student teachers and their supervisors review the videotape together to study in detail the planning and execution of the lesson, and they also make an analytical appraisal of the teaching. While this approach emphasizes to student teachers that they must meet an adequate level of competence in the profession, the approach also clearly considers the imprecise nature of the assessment of teaching. Students are initially apprehensive, but most appreciate the learning process involved with videotape recording. The author concludes that this approach offers a very useful method for stimulation of continuous professional development.

The Transfer of Technology in the Preparation of Professionals: Myth or Reality? The Case of Nursing Education (Matous, Edith, University of Victoria, British Columbia, Canada)

> Advances in communications technology are rapidly affecting all professional fields, including professional education. In North American countries, such developments have led to an increasing use of distance education in the preparation of nurses, especially at the university level. This paper examines the feasibility of transfering this technology to the nursing system of a developing country. Survey data regarding the needs and problems of the nursing education system of Papau New Guinea are considered as well as the technological and educational infrastructure. The distance education systems of developing countries are examined with a view of providing a more appropriate technological solution to the problems of Papau New Guinea's nursing education system.

A Statewide Collaborative Computer Inservice Training Project (Pickles, Bob, Washington Education Association, Federal Way, Washington, U.S.A.)

> A program for the inservice training of teachers in the use of computers, developed by the Washington Education Association, is described. The collaborative, statewide program has nine modules on the topics of: knowledge of computers; controlling the computer; using computers in teaching; educational issues; the computer in society; LOGO (a computer language); writing with the computer; computers and the handicapped; and classroom management. Over 4,000 teachers have participated in various aspects of this training with excellent evaluations. Computers should continue to be investigated for their possible uses and abuses in the classroom, and all teachers should have thier own computer for their use and training.

A Model for Integrating Microcomputers into Teacher Education in Thailand (Quisenberry, Nancy, James Quisenberry, Jitbanjong Somkroot, and Tongchai Somkroot, Southern Illinois University-Carbondale, Illinois, U.S.A.)

> A model for integrating the use of microcomputers into the teacher education program in Thailand is described. The model could be used by other developing countries interested in incorporating elements of microcomputer technology into their own teacher education programs. The major goals of the model are to focus on administrative use of data management, instructional use of educational software, and computer assisted instruction in teacher education classes. Although the model is in its grassroots stage, the steps taken so far will help Thailand to maintain its position as a leader in the continuing development of teacher education in Southeast Asia.

Educational Technologies: A Unified and Fluid Approach (Sullivan, Timothy J., University of Central Florida, Orlando, Florida, U.S.A.) SP026750

The faculty of the University of Central Florida, College of Education, provides a holistic approach to the education of teacher candidates relative to educational technologies. A required course for all education majors integrates all forms of educational media, including microprocessors, into a body of instruction and skill development. The course informs students on how to select from, and correctly use, current technologies in an educational setting. No computer programming is taught, though there is a special emphasis on software evaluation and word processing. Students develop technologies in relationship to classroom instruction and student learning including interactive videodiscs, input and storage devices. The course is designed to evolve with emerging educational technologies, as opposed to having to design new courses of instruction or components of instruction (within courses) specific to each new emerging technology. This paper presents some facets of the course, its functioning and objectives. It also provides information sufficient for participants to use in discussing or developing similar courses in other settings.

Partners in Curricular Reform: Computers and Creativity (Warren, Thomas F., Beloit College, Beloit, Wisconsin, U.S.A.) SP026759

In southern Wisconsin and northern Illinois a group of schools have united to form the Beloit Educational Computing Consortium (BECC). A recent survey of selected teachers in BECC schools indicated that even though the schools do not consciously set out to teach creativity via computers, substantial creative behavior is demonstrated by the children who use the computers. According to the teachers, creativity has manifested itself most clearly when pupils program and when they write using the word processing capabilities of the computer. By applying these tools, pupils develop their own ideas after trying different options. The surveyed teachers also noted the ways in which potential creativity can be blocked. In particular they noted that the least stimulating examples of software contain lengthy directions, few choices, and minimal interaction and reinforcement. In this paper, an analysis of the human thinking processes which lead to creativity forms the foundation for a discussion on the salient factors that should be incorporated into a computer curriculum designed to enhance and develop creative thinking in students using the computer as a tool.

SECTION IV

Research in Teacher Education: New Emphases in the Information Age

The Impact of Research on Teacher Education

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With hindsight, I think that I should not have agreed to take on a topic as broad as "The Impact of Research on Teacher Education." I prefer another title, "Great Expectations with a Small Dose of Reality," since this more accurately reflects the conditions of research especially as they are found in teacher education.

I would like to share with you some different areas of research, but in doing so try to be like a stone skipping across the water, touching on those areas of research that I believe hold promise. I will try to deal briefly with research on teaching, teacher education research, teacher education program evaluation, induction, inservice teacher education, and the change process in schools and colleges. I would like to end up with an identification of some issues that we are facing in teacher education, some of which may be able to be addressed by research.

Basic Assumptions

There are three assumptions or premises that should be kept in mind. These include an emphasis on the professional continuum, a distinction between research on teacher education and research on teaching, and the clarification of some of the conflicting expectations about the goals of preservice teacher education.

The first assumption has to do with the professional continuum. One of the keys to our thinking about teacher education from now on must be to view it as occurring across the professional continuum. Traditionally, and still with many of our less well informed colleagues, the definition of teacher education is limited to the college-based experiences of preservice teachers. This definition of teacher education has been driven primarily by the organizational arrangement of preservice teacher education activities done traditionally in schools, colleges and departments of education.

It makes much more sense to define teacher education from the point of view of how teachers experience it, rather than on the basis of the institutional or organizational arrangements that have historically been used to deliver it. From the teacher's point of view, teacher education is a career-long continuum of formal and informal experiences. Because of the odd way that teacher education has been organized institutionally, with colleges being more responsible for preservice and school districts singularly responsible for inservice, no one is responsible for induction. Teachers have been left with the challenge of making sense out of their own disconnected educational experiences. We must now see the professional continuum as beginning with preservice and initial training experiences. This phase is followed by the induction phase, which in countries other than those in North America has been recognized for some time. The continuum continues throughout the career-long activities of teachers, with staff development and inservice teacher education.

The second assumption has to do with research on teacher education as differentiated from research on teaching. Research on teaching entails studies of teachers, students and classroom practices. There is important information out of this research that should inform the content of teacher education. Research on teacher education includes studies of the process, content, participancy, and context of teacher education wherever and however it occurs at all points across the professional continuum.

At this time, research on teacher education is in a much more embryonic stage than is resarch on teaching. Over the last ten or fifteen years, an impressive array of accumulating findings have unfolded in reseearch on teaching. I am optimistic that in the next ten or fifteen years, a similar trend will occur for research on teacher education. However, teacher education is more complex, more multivariate, and includes a much larger number of potential study questions than classroom research. As a consequence, one recommendation I offer is that we more carefully plan and coordinate our teacher education research activities in the future so that there is potential for accumulation. Without such coordination, we run the risk of continuing the present patterns of research in which each researcher does his own idiosyncratic teacher education study. Without coordination, the study questions, variables measured, the subjects studied, and so forth have little in common, making it impossible to identify cross-study trends or to accumulate findings. It may be that ICET could serve as a mechanism for helping us to think about shared study questions in teacher education research.

The third assumption has to do with expectations for teacher education. Many different constituencies hold very different expectations for what should be accomplished in teacher education. The consequence is that preservice teacher education is in a crossfire of conflicting demands. Given the schizophrenic state of preservice teacher educators, no one has been effective in developing and articulating reasonable aims for preservice teacher education. To illustrate these constrasting expectations, consider the different types of graduates that different expectations imply. Four very different images of beginning teachers emerge: the ready-made teacher, the missionary teacher, the professional teacher, and the inductee teacher.

> The ready-made teacher. Many critics of preservice teacher education at this time argue that there should not be any preservice teacher education program. All that is needed for teachers to enter the profession is a baccalaureate degree in the academic subject area that they are going to teach. This point of view argues that there is nothing to be learned about pedagogy, understanding how students learn, the development of adolescents, and how social and economic factors affect children's learning. All that is needed to teach physics is to have a degree in

physics. Whatever teachers need to know can be picked up as they begin teaching. From this point of view, the student leaves the university or college and is ready-made as a teacher. This position, by the way, is not advocated by school people; it is more frequently expressed by various experts removed from the daily life in schools.

The missionary teacher. Some argue that the purpose of preservice teacher education is to prepare students who will go forth and bring the schools from their backward practices, advancing and saving them from being out of date. Preservice teacher education in this orientation is training to advance views that are most frequently held by college faculty at the time. Implicit in this expectation is the position that preservice teacher education is sufficiently powerful to develop in its graduates not only all of the skills needed to survive and be effective in the schools of today, but also the capacity to serve as change agents and revolutionaries, bringing about significant change in the established practices of the schools and of their senior colleagues in those schools.

The professional teacher. In this vision, teachers will leave their preservice teacher education program with all of the skills that they need for career-long practice as a teacher. They will know how to work with all kinds of learners, all kinds of situations, and will be better than the more experienced teachers in the schools. And this gets played out when you look at how school districts assign their teachers. School districts, at least in some countries, tend to give new teachers more kinds of preparations, more extracurricular responsibilities, the least manageable students, and the most complex array of diverse assignments possible. As they become more experienced, they are given less difficult assignments, less variation in number of preparations, and students who are easier to work with. The expectation on the part of many school districts is much more optimistic than is held by even the most ideal college faculty.

The inductee teacher. The basic premise is that teachers in preservice training need to be prepared to survive the first year of being a fulltime teacher. The design of these programs is aimed at getting them ready for the first year without attention being given to the career-long skills that need to be developed.

Expectations like the above determine in large part what we look for and talk about in evaluating our programs and in conducting the training that goes on. Expectations like these also bear heavily on what a research agenda would look like; the research questions would be very different depending upon the expectations held for graduates. If we were looking at beginning teachers as professionals who are going to be career-long able, then the evaluations we do on teacher education programs would be very different than if we were talking about programs to prepare teachers to survive the first year. As I go on, I will continue to point out expectations like these that make doing research in teacher education so difficult.

Research on Teaching

One of the areas that I would like to deal with in a little more detail, where we do have an accumulating research knowledge base, is in the area of research on teaching.

This is a very rich area for research. It is one area where our research knowlege base is meeting our expectations for research that can be applied to teacher education practice. Due to a series of initiatives in several national governments, a number of researchers have been encouraged to talk to each other about their studies. As a consequence, there is a nice, accumulating set of findings in classroom research. This work does have implications for teacher education in all of our countries. Twenty years ago, when I was a student teacher, I was supervised and evaluated on the evenness of the windowshades around the room. Eighteen years ago, all of our student teachers were "Flanderized:" subjected to the observation system which analyzed how often question asking and lecturing occurred. There was an ideal definition of teaching behavior based upon the theory that indirect teaching was more important than direct teaching. Then we started looking at relationships between teacher behavior and student behavior, leading into the more recent classroom teacher effectiveness research from which we are able to identify specific kinds of teaching behaviors that are associated with student achievement. These studies are consistent across researchers and across time. One of the keys to this developing area of research has been an increased sensitivity to the context of the classroom. It has been possible, for example, to look at research in second grade, lower socioeconomic class students, and to talk about the achievement gains they can make if teachers do certain things. We have become a lot more understanding not only about teacher behavior, but also about the conditions of students in the classroom that make a difference.

One area of research on teaching that has emerged more recently is what we are calling classroom management research. At the Research and Development Center, much of the research has been done around this idea. Think of some of these as topics that are relevant for teachers beginning any school year. The research has suggested that there are some different ways in how teachers organize and launch the school year, for example. The more effective teachers do things differently than the less effective teachers. We developed a manual summarizing some of the topics. For example, what should the procedures be regarding students' desk spaces, materials storage, their approaching learning stations, sharing materials. What about the teacher's desk? Can students go into it at any time? What about when they are in other areas of the school? How should they behave? What happens in whole-class activities? What are the precedures for them to be recognized, to ask questions? When in small group settings, how should the students behave, and how should those who are not in the group behave? There is a whole range of these small details in classroom management that research has shown make a difference in how successful teachers are from the very beginning of the school year. And as a teacher educator, although these are obvious when I hear them, I would not have thought to introduce them to my teachers. Another example has to do with rules for the year. Teachers should have only five or six overarching rules. If there are more than that, they are ineffective. When there are too many rules that are too specific, no latitude is allowed for the unexpected. A whole series of practical suggestions are emerging from our work with classroom management. We are becoming more aware of the richness and complexity that a teacher has to work with in the classroom. If the classroom environment is not managed in some way, it is not possible for a teacher to move on to the business of teaching and learning. Classroom management research is giving us some ways to deal with this.

Research on Teacher Education

There is some research going on in which we are looking at teacher education coursework and programs. An area that is beginning to receive attention is how discipline faculty and pedagogical faculty can work together on course development. An example is the Mathematics Teacher Education Project in the United Kingdom, where mathemeticians and teacher education faculty are working together to develop materials. Closer to home, the University of Florida built a new program, called PROTEACH, which is using the results of research on teaching as the subject matter content for their teacher education program. The basic guideline is that if there is not a research base for it, it is not included in the program. A different kind of orientation is the one at the University of New Hampshire, where they are using adult development models to build a program that keeps track of students across years and looks at how they are developing cognitively.

We are at a time when some individual coursework innovation is going on that is built on various research strands, and where some program development is based on some of our more recent research. Unfortunately, the average program is probably still offering roughly the same kinds of things as before.

One of the other outcomes of all of this that ties back to classroom management is that we recognize the need to think more about training teachers for different contexts. All teachers do not go out into the same classrooms with the same kinds of students.

Another area of concern is how we evaluate programs and how we do followup studies. There has been a gradual increase in attention to the effects of teacher education programs and to doing followup studies of graduates.

Still another area is that of induction, an area that is a hotbed of research right now in a number of countries. There is much to be learned about where we place beginning teachers and how we support them during the induction phase.

An International Dimension

Increasingly, policy makers are asking about research; they want to know what research says about effective teachers, about teacher education. A problem is that many policymakers and legislators do not use the results of research in appropriate ways. They will over generalize, for example. We have to work more with policymakers to help them to understand the limits of research, but it is nice that they are asking about it.

Another concern is that many of us in the teacher education community are not sensitive to the ideological debate that is beginning to emerge. It represents issues and questions for all of us, whether we are in research or in program development. There are seeds of revolution within teacher education, appearing in what we advocate in some of our teacher education programs, and in some of the emphases and frameworks for research. In the United States, there is a group called the "Holmes Group," which is examining where teacher education should go. Made up of deans of large research universities, its basic recommendations are for high quality, high knowledge-oriented, "elite" teacher education. The idea suggests that we must work with few students in excellent ways to make them reflective, analytic, powerful teachers. There is another group of theorists and researchers coming from a number of different disciplines, who have a Marxist orientation, arguing that the purpose of preservice teacher education should be to train teachers to question social and economic injustices in schools. The importance of these for us as researchers and research consumers is that we are going to have to look more closely at the assumptions underlying various research paradigms, and not look only at the results of the research.

An organization like ICET has a very important role to play because we have to start working more from an international perspective in research and development in teacher education. There are some interesting differences across countries that we ought to learn from because problems in one country or region may arise in others, sometime in the future, and as we develop solutions, we can advise each other in some way. One of those interesting differences is that the United States is about to have a teacher shortage of incomprehensible proportions. At the same time, the Province of Ontario, Canada, has plenty of teachers. We have the opportunity to learn from each other in how to attend to demographics and how to anticipate these things so that we can move beyond them.

One of the nice things that has been happening in recent years is international exchange of research. OECD and CERI have a project in inservice teacher education bringing together people from different countries to talk about and share research and development activities. Another nice thing is that associations like SPATE always bring in some outsiders to exchange ideas. Also, AERA is placing a heavy emphasis on international perspectives in its next annual meeting; each of the divisions has the opportunity to support some people from other countries coming to this North American conference. We are beginning to think more internationally, and ICET has been one of the pioneers.

Conclusions

As we continue our research and development programs, we must think of teacher education across the continuum. We have got to think about career ladders, induction, inservice training, and that longer-range perspective that comes from the point of view of teachers. We have to think about what research can and cannot do. It will not necessarily confirm what we already believe. It can suggest alternatives. We can use it to help map out different directions. We have to start thinking more about what we mean by research; to policymakers, research is data on one variable that supports a position. To researchers, it is how variables interact with each other. And so we must learn to communicate with policymakers in terms of their understanding of what resarch is.

We have learned that teacher education is a very complex field for research. As teacher educators, we must help to define and set priorities on teacher education research so that its results accumulate and become useful for the continuing improvement of teacher education worldwide.

Research in Teacher Education: New Emphases in the Information Age in England
Panelist's Comments

Denis Lawton
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One of the favourite comparisons in England is to suggest that if a surgeon Rip Van Winkle had gone to sleep in 1885 and awakened in 1985 he would be completely bewildered by the changes in his profession. On the other hand, it is alleged, a teacher Rip Van Winkle, after a hundred years' sleep, would find himself very much at home in a typical classroom in 1985. This is not completely true, but there is enough truth in the allegation to make us think carefully about the role of the teacher and the culture of schools. Despite enormous differences in history and culture, schools everywhere seem to be more similar than they should be. Schools have a culture of their own which is, to a very large extent, a backward-looking culture. Schools and teachers are slow to change.

One of the enduring themes of research into classrooms is that teachers do too much teaching, while learners do too little learning. Teachers talk too much and expect their students to listen. Teachers, when they ask questions, ask the kind of question that demands a particular response, possibly a one-word "right" answer, rather than the kind of question which opens up discussion, encourages the development of a hypothesis, stimulates the students into thinking for themselves and so on. Most teacher educators are very well aware of this ineffective style of teaching, yet they seem powerless to change it. In fact, many of them teach that way themselves.

One of the hopes for the new technology was that it would encourage changes in teaching style. Computer assisted learning should encourage the development of individual learning rather than class teaching, and experimental learning rather than didactic teaching. It is perhaps too soon to evaluate the effect of the computer, but the signs are that the culture of the school is quite capable of resisting this latest influence.

I am optimistic that, in the long run, the new techology will produce changes in teaching style and encourage not only individualized, experiential learning, but also free the teacher from the constraints of the traditional classroom to engage in the management of learning in a variety of more effective ways.

Meanwhile, the picture is a much less happy one. The influence of the computer on teacher education in the United Kingdom has had much less effect on teaching and learning styles than on encouraging a new wave of criticisms of teacher education. These criticisms take two forms: first, that teacher education is expensive, inefficient and should be subject to much more central control; secondly, that teacher education should be more concerned with giving value for money, and (together with the rest of higher education) should be much more concerned with demonstrating value for money in the form of performance indicators.

Central Control of Teacher Education

In 1983, the Department of Education and Science (DES) published a document for discussion written by Her Majesty's Inspectors (HMI) called The New Teacher in School.(1) Although the research base of this document has been declared suspect, it did show that a percentage of new teachers, recently graduated from teacher training establishments, were ineffective in a variety of ways; their initial training courses had not equipped them sufficiently well for the classroom. This "research" was, of course, backed up by classroom folklore, whereby practicing teachers indicated that the new teachers were "not as good as we are." The New Teacher in School was followed by a Government White Paper, Teaching Quality.(2) The Department of Education and Science and the Secretary of State for Education, Sir Keith Joseph, had been concerned for some time about the quality of teacher education, which they saw as the key to an improvement in the standard of teaching generally. Unfortunately, Teaching Quality was very much criticized by the teacher education world for a number of reasons. First, it was said to be lacking any kind of theory; second, it adopted a technicist, bureaucratic approach to the problem, rather than a real concern with quality. The irony of the situation is that the DES authors of Teaching Quality quote The New Teacher in School based on HMI research to support the view that "the personal qualities of the teachers were in many cases the decisive factor in their effectiveness." In other words, knowledge and skills do not necessarily make a good teacher. Yet the major thrust of Teaching Quality is to emphasize knowledge and skills at the expense of other qualities. And all this at just the time when many teacher education establishments were re-examining their curriculum to endeavour to move away from an emphasis on knowledge and educational theory to a much greater emphasis on "experience-based theory."

It should certainly be emphasized that not all the recommendations of Teaching Quality are bad. But it does advocate bureaucratic control of teacher education rather than attempt to approach the question of the preparation of new teachers from the point of view of professional quality.(3)

One of the results of this new move towards central control has been the setting up by the Secretary of State of a new Council for the Accreditation of Teacher Education (CATE) which will have the responsibility for making sure that all institutions offering courses of initial training of teachers follow a set of very rigid criteria.

Value for Money

The second form of criticism I mentioned earlier was the demand for greater "value for money." This is a general move in higher education in England at the moment, but it poses particular problems for teacher education. The background of this criticism is the determination of the government to reduce public expenditure, including expenditure on education. Higher education has already suffered cuts of about 15 percent over the last four years, and we are now promised another 8 percent cut over the next four years. The cuts alone would be bad enough, but we are also being told how to demonstrate efficiency in the midst of these cuts. "Value for money" is the dominant slogan, and performance indicators are the particular method embraced by some in government circles. The ironic relationship between this movement and the new technology is the tendency to demand that everything should be carefully quantified and measured. The computer makes this possible, therefore, it must be done!

Reacting to pressure from Government to demonstrate greater efficiency, the Committee of Vice-Chancellors and Principals, in April 1984, appointed a committee to promote and coordinate a series of efficiency studies of the management of universities. The Committee was chaired by Sir Alex Jarratt, Chairman of Reed International and Chancellor of Birmingham University. The "Jarratt Report" was published in March 1985.(4) The report makes a number of very sensible suggestions about resource allocation and other measures designed to promote efficiency, but there is a general assumption contained within the report that the consensus style of management is inferior to the managing director model of business. One of the Committee's less acceptable recommendations was that universities should develop "reliable and consistent performance indicators." The performance indicators are set out in the report as follows:

> Performance indicators for universities have proved difficult to devise and there is no universally accepted series that is in general use. Most universities have devised their own series, but these are only rarely brought together and considered as a whole. The indicators are commonly divided into three categories:
>
> (1) Internal performance indicators include:
>
> a. market share of undergraduate applications (by subject);
>
> b. graduation rates and classes of degrees;
>
> c. attraction of masters and doctoral students;
>
> d. success rate of higher degrees (and time taken);
>
> e. attraction of research funds;

f. teaching quality.

(2) External performance indicators include:

a. acceptability of graduates (postgraduates) in employment;

b. first destination of graduates (postgraduates);

c. preparation judged by external reviews;

d. publications by staff and citations;

e. patents, inventions, consultancies;

f. membership, prizes, medals of learned societies;

g. papers at conferences.

(3) Operating performance indicators include:

a. unit costs;

b. staff/student ratios;

c. class sizes;

d. course options available;

e. staff workloads;

f. library stock availability;

g. computer availability.(4)

One point that immediately needs to be made is that all universities, including departments concerned with teacher education, use performance indicators at the moment. We at the University of London Institute of Education frequently boast about the very high number of applicants for each PGCE place available, but we are well aware that this is only a very crude indication of our reputation rather than a measure related in any way to efficiency or work effectiveness. We also make much use of employment figures, demonstrating the fact that nearly all those who graduate from our initial training courses find the kind of employment that they want in the schools. But, once again, we are well aware of the fact that the employability of our graduates has much more to do with national supply and demand of teachers generally than the excellence of our own course. Similarly, the University Council for the Education of Teachers (UCET) uses our figures and others to show that our graduates are more employable than those produced by polytechnics and other public sector (non-university) institutions of teacher education. We are well aware that these are very crude figures, and we should not make too much of these comparisons.

If we wanted to take the Jarratt view of performance indicators seriously, we would have to divide performance indicators into three stages: pre-course indicators; in-course assessment; and post-course indicators. The model we would then have to develop would look something like that appearing below.

Performance Indicators for Postgraduate Certificate in Education

Pre-course	In-course assessment	Post-course
Personal		Short Term
Class of degree	Teaching practice by Tutor supervising teacher	Employed as teacher employed elsewhere in education
Grading at interview (i.e., Predictive PI)	Self assessment	
Previous experience	Course work	
Tutor's reference	Final examination	
Institutional	Institutional	Long Term
Applications per course place	Staff/student ratio	Promoted within three years five years ten Years
Qualifications of staff	Unit cost (including library, etc.)	Still in education after ten years twenty years
		Evaluation as a teacher after ten years twenty years forty years

Given the existence of computers it would be quite possible to weight each of these factors and to produce some kind of model which would calculate "efficiency." The computer makes it quite possible (for some even interesting). But would it be worth it? The degree of arbitrariness in weighting each of the factors would invalidate any real attempt to produce a meaningful cost benefit analysis. The calculation would have to depend on very dubious assumptions. For example, how important is the class of degree of the teacher trainee at the beginning of the course? Elsewhere in the United Kingdom, much is made of GCE A-level scores on admission to universities. Popular universities can demand much higher scores than less popular universities. But the predictive validity of the A-level scores is notoriously low. At best there is a correlation of 0.4 between A-level results and eventual class of degree. The relationship between class of degree and quality of teacher at the end of the course is likely to be even lower. But universities who are able to attract those with good A-levels make much of this ability; on the other hand, those who have to be content with students with lower A-level scores claim to be doing an even more important job in bringing those "poorer" candidates up to standard and in their getting a degree in the end. As with so many of these indicators, they can be used to argue quite different cases. Similarly, some would deny the case for attaching too much importance to assessment of teaching practice. It is very important for a student to be aware of the quality of his or her performance, and perhaps this is relevant to his future employers too. In extreme cases a teaching grade will decide whether a student passes or fails the PGCE course completely. But we all know that a student's performance on teaching practice often has much to do with the kind of school he is in rather than his own ability as a teacher. It is notoriously difficult to make adjustments for the school situation in this, possibly the most important, aspect of performance measuring. The whole process is shot through with so many difficulties that it would be foolish to attempt to quantify it with any degree of accuracy and to base any serious arguments about resources on it. All of these measures individually might have some importance, but any computerised model would be indulging in spurious accuracy.

A more serious change is that the whole exercise would be based on very doubtful assumptions in any case. My predecessor as Director of the University of London Institute of Education, Dr. William Taylor, once wrote an essay on "Metaphors in Educational Discourse." He had this to say about the concept of quality control:

> An interpretation of quality control drawn from industrial practice . . .is of only very limited application to the determination of quality in non-marketed goods such as education. There are problems in defining quality. The use of the "control" implies a pattern of relationships, but there is little relationship to the human reality of institutional and systems management.(5)

Nevertheless, those in the education service are being exhorted to develop measures of performance to demonstrate quality. The whole exercise is being taken very seriously by the Chartered Institute of Public Finance and Accountancy (CIPFA). A document, Performance Indicators in the Education Service, was produced in 1984, which referred to the "Local Authority Annual Report" and which contained a Code of Practice issued by the Secretaries of State for the Environment and for Wales, and deals with the publication of annual reports and financial statements by the local authorities.(6) Annex A of the Code indicates that "It is intended that each authority should publish a short list of performance statistics relating to major services it provides."

Conclusion

Much of the research time and energy of teacher educators is occupied at the moment with one or the other of the two criticisms referred to above. Answering criticisms is a negative activity at a time when so much positive action and research is needed.

But the real point of my analysis is much more fundamental. The clear message of the recent English events is that the new technology is neither good nor bad in itself. It all depends on what teachers, schools and the whole educational system do with the new technology. The new technology certainly has the potential for liberating the teacher from obsolete practices; it also has the potential for encouraging more experiential learning and greater autonomy for students. The reverse is also true: the wrong attitude to technology can have a dehumanising effect on schools. Students (and teachers) can get "hooked" on the purely mechanical aspects of computers, for example. To avoid the real disadvantages of the new technology, not only teachers, but education administrators and politicians, need to be educated to a better understanding of the underlying purposes of the education process. As with so much in education, the important issue is a question of changing attitudes and values rather than simply acquiring skills and knowledge.

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Research in Teacher Education: New Emphases in the Information Age in the Philippines

Panelist's Comments

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The theme of this ICET World Assembly is most appropriate. At this time, when vast amounts of information have accumulated with advances in educational technology, but have not been disseminated and utilized in the preservice and inservice of teachers. It is for this reason that I found the topic, "Research in Teacher Education: New Emphases in the Information Age," most challenging.

We realize that various sectors of our society pin their hopes on education as the key factor in the overall plan for development, for economic growth, and for socio-cultural progress and peace. We believe that what we do in teacher education institutions today determines to a large extent the world of tomorrow. Hence, our investments in education have to be translated into action leading to the self fulfillment of our children and youth and to social change.

Our instrumental view of education to achieve the goals of national development is the most pressing concern of education at present. It is a valid concern, for without education, the acceleration of national development may be hindered and our nations deprived of one of its key resources: trained manpower who are humane and able to contribute to the total development of society.

Our training programs for educational personnel can contribute more effectively to this aspect of human resource development and national progress if it is planned in relation to national development. This has been our purpose in developing countries including the Philippines.

Starting with the decade of the 1960's, information is recognized as a commodity. It has been observed that information can be sold, given away, copied, created, stored, misinterpreted, distorted, and stolen, among other things. Since everyone has the right to use it, its nature and structure must be better defined, and a strong philosophical base must be prescribed for it. Our own Minister of Information of the Philippines, in a recent statement before the UN Committee on Information, stated emphatically that the problem of information and the principle of the right to communicate is a basic thrust. The right to communicate underpins the view that information is a social property meant to be shared by many people. Furthermore, the plurality and diversity of sources and channels of information make up a system of checks and balances against propoganda misinformation, and biased reporting.

What is the role of education technology in education? To what extent have new developments in communication been brought to bear upon education and schools? Mention of the new media in education immediately brings to the fore a discussion of video technology, instructional television, audiotapes and computer assisted instruction. All these technologies have had much impact on education and teaching although in relative terms in different countries. There seems to be a time lag of about two decades between what affluent countries have and what the developing countries are just starting to consider. Because of this time lag, there has not been much research in Asian countries concerning the use of videotechnolgoy for teaching, particularly in teacher education. The use of the overhead projector, for example, is limited because most schools in many developing parts of the world cannot afford to get even one such projector. One of the more basic problems in the developing countries is to help a school obtain a roof, a blackboard, chalk, and a teacher.

Broadcast and television media as a supplement to formal classroom teaching has not advanced as fast as one might desire because of the prohibitive cost of television and broadcast time, and the lag between the need for radio instruction materials and the speed with which materials are turned out. In the Philippines context, radio as a medium seemed in the 1970's a more appropriate medium. A development program for radio-delivered lessons for elementary school children, known as Radio Assisted Teaching in Elementary Schools (RATES) was introduced in 1975. It was discontinued after about two years. A Philippino counterpart of Sesame Street was inaugurated in 1983, and has been aired over one television channel. Research findings on its effects however have not been made known. However, the program is starting to gain awards from civic groups because it provides learning using a Philippine cultural values format for children in their homes.

While a number of government information programs, particularly on vocations, agriculture and science, have been shown on television, few programs have been for teacher education, where print materials have been more widely used. Printed modules and self-learning lessons have been used as alternatives to formal classroom delivery systems for inservice education of teachers. The printed modules are accompanied by videocassette tapes. This combination together with trainers is the approach used in the formal and nonformal inservice training of primary school teachers in the teacher education program begun in 1981. This approach is used also for distance education programs for those currently teaching. At least two agencies in the Philippines have started distance education schemes.

The Philippine experience with the University of the Air is one that is based in the University of Mindanao in the southernmost islands of the Philippines. However, this prototype program has not been sufficiently expanded. It relies mostly on lessons broadcast over radio. It is this education delivery approach which is being considered for distance education of teachers to help them grow professionally. The experience of Japan with the University of the Air is far ahead that of any Asian country. For one thing, Japan had a great head start on the use of broadcast media in education. For example, as early as 1950, radio school broadcasts were being used by 30 percent of the elementary schools and 22 percent of the secondary schools. Since 1971, the rate of use has remained fairly stable at 37 to 38 percent. From 1965 up to the present, at least 80 percent of all the elementary schools in Japan have a television receiver in every classroom. Over 50 percent of junior high schools and senior high schools are using television school programs. About three-fourths of the high schools retain videotapes of programs which have been aired in previous years. Since the early 1970's, several research studies have been conducted on the University of the Air in Japan, and these have been the basis for policy concerning University of the Air programming.

In the College of Education of my University, short term inservice courses and preservice courses on college teaching have been conducted since 1980. Qualitative observations of effects of feedback from supervisors and peers of individuals' teaching behaviors show that replay elicits favorable comments from the teachers who demonstrated teaching lessons. In the inservice training course on college teaching for the faculty, videotape playback of teaching demonstrations has been consistently rated as the activity which gives the participants the most useful insights about themselves. Listening to audiotapes of their teaching delivery is also viewed as a useful feedback device. Admittedly, few schools can afford video equipment. Definitely, though, every college of education and teacher training institution should try to avail itself of this video technology. The cost of acquiring and maintaining such technology is more than made up for by its effectiveness in instruction.

Computer technology cannot be overlooked. While we recognize the enormous capability of the computer for assisting instruction, we draw upon experiences of advanced countries concerning the inability of teachers, educators, technologists and administrators to keep pace with the demand for software. While computer hardware technology has progressed dramatically, the production of software programs has been relatively slow. If we get them in the developing countries, chances are that they are culture bound. I see research on computer assisted instruction as having much potential in basic learning reserch. Definitely, the hardware will be capable of monitoring simultaneous feedback from many learners while also providing feedback to learners. These capabilities could be studied to provide additional significant information relative to theories of teaching and learning. However, I do not foresee the use of computers at a level where every pupil has his own keyboard and terminal in our developing countries, because the costs of such an arrangement are currently prohibitive.

In addition to its potential in teaching and learning, computer technology in education in the context of developing countries has great potential for information storage, retrieval and dissemination. In this mode, computers should be seen as appendages or tools for classroom instruction. I would like to invite our colleagues, including especially those from the Asian countries who have more or less the same culture, to undertake collaborative research in teacher education which, as we have heard earlier this morning, is really at an embryonic stage. In fact, in one UNESCO conference in Bangkok, it was summarized by our delegates that even the inservice education of teacher educators has been left in God's hands, while we have concentrated more on the preservice training of teachers. Even the training of educational administrators has been overlooked. So, we would like to invite our fellow teacher educators to think of collaborative research that is meaningful to our cultures and society. We hope that having reviewed the philosophy of education and teacher education in the five member countries of ASEAN during these past three years, we are in a better position to mount these collaborative efforts.

Research in Teacher Education: New Emphases in the Information Age in Canada
Panelist's Comments

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I believe that while we may have entered the Information Age, we have really not yet begun to feel its full impact. We are talking about a future phenomenon. I think it is important in the argument that I will make this morning to outline certain assumptions that I hold.

In the form of providing a context, I would like to state some assumptions about teacher education and the schools for which they prepare teachers. Then, I would like to make some guesses about the future. Next, I would like to say a little bit about the research in teacher education and on teaching, skipping the stone across the waters as Gene Hall did. Then, I would like to offer my main argument, which is that we must begin to think very radically differently about teacher education and about research in teacher education and how we work with that research so that it can have an effect on the schools.

The first assumption is that many of the problems that beset us now in education and teacher education will continue. One of the major problems in education, and perhaps it is a major social problem as well, has to do with the lack of reform in the schools. There is a growing recognition among those concerned with education that the schools are in a very difficult period. Central to this difficulty, I contend, is that while changes have gone on and become commonplace in society, the schools remain much as they always have been. We seem always to be training children for a future that does not exist. While it could be argued that the problem is one of perception, and not of fact, and that many schools are doing an excellent job, I see the evidence as overwhelming that the educational establishment at all levels has shown a remarkable inability to implement reform and to make schools more effective learning environments for children.

Efforts to create more effective schools through legislative fiat and through following the grand designs of master planners have failed. I really cannot identify one single thing initiated in high places that has made the school much better. Reform typically occurs through teachers and through schools, and I think that will continue. My first assumption suggests that reform in the schools will continue to be a major problem in the years ahead.

The second assumption is that we will continue to have schools. There are those, at least in North America, who contend that there is a deschooling movement about. Somehow, with the computer age, we are going to have children educated in supermarkets where they sit with little computers and do all sorts of interesting things. I think that notion is quite bizarre. It is neither feasible to have this kind of thing occur, nor is it desirable. Schools will remain. The question is whether they will be effective. This links very much to the national aspirations that we have as people. As we go into the Information Age, I am sure that those countries and regions that will lead in that Information Age will be those that somehow are able to maintain and to create more effective schools. It is not a matter of the schools not being there, it is a matter of how effective they are going to be.

The third assumption is that the major goal of teacher education in society is to work toward the betterment of the schools. I say that because many of the designs that I see simply do not address those things. Quite frequently, we as change agents, or administrators, or professors of education tend to get caught up in our own designs and ambitions and careers. We forget about the fact that we are there to make the schools better places to live. We ought never to forget that.

I would like to offer a few predictions about what I see happening. First, we are going to see the division between the "haves" and "have-nots" increase much more than at present. The rich will get richer and the poor will get poorer. One of the reasons I am so supportive of public schools is that they are one of the ways in which that situation can be rectified.

Second, governments will spend increasing amounts of their resources to maintain order in society. It is already happening, at least in this Province. Supporting schools and hospitals will take a lower priority to that main priority of governments.

Third, there will continue to be erosion of authority in education. It is already occurring, and it will continue to occur. This does not mean that groups such as universities, departments of education and state departments will not have influence, but it will be influence of a different kind.

Fourth, the future will see continued research in teacher education. This will occur because of the curiosity of the people who are doing the research. But because of the blatant disregard of the practitioner that is so typical of research efforts in high places, research will have very little effect on the schools.

There are three areas of research-based knowledge that I would identify. One area is knowledge about teaching. Here the base has expanded enormously. There is now so much known about how we can do a better job of teaching and how the schools can become more effective. I think the problem is just coping with that mass of information, and implementing those ideas and developments. Producing more research is not the main problem.

The second area is knowledge about the school and about the classroom, which I think is quite revealing. It is probably more so than the research on teaching. From this research and from a large number of ethnographic studies and from people simply looking at schools up close, it is clear that there is great complexity in classrooms and schools. They have regularities and patterns that are determined by the children in them and the teachers who teach in them. Reform must take these things into account. This body of research is very important and significant, and it has to be carefully looked at as we think about reform.

The third area is knowledge about teacher education. Here there is some but not very much research; Gene Hall was correct when he said that this research is in its infant stage. The little research that has been done seems to indicate that teacher education is a very complex phenomenon. It indicates that faculties of education as organizations are almost impossible to change. If we think reform in the schools is difficult, contrast that with reforming faculties of education. I contend that one of the major things that we must do in teacher education is to come to grips with what it is we do, with the arguments that underlie our teacher education programs.

One of the areas we must attend to much more closely is faculties of education and the ways they train teachers. I am very happy with the attention that is now being placed on teacher education in North America and Great Britain. I hope that continues. None of that will have effect unless we do some other things.

Having said that, let me conclude with my main argument. Our best investment in improving schooling will come through focussing on the school as a unit of change, and improving the working lives and skills of teachers. Teacher education has typically focussed on psychological aspects of schooling and on methods, ignoring the social and political aspects of change. We do not teach our new teachers how to cope with this social system. Our efforts from outside the school have failed. This has very little to do with ideology; it has to do with the practical fact that we cannot accomplish much reform in the schools from the outside.

Those people who are involved in research must become more accountable to the schools and the teachers. We must begin to build bridges between the mountain of research that is now accumulating and the people who can put it into practice. That is a very important priority. Here is where we have to think in radically different ways. Research does not translate directly into school practice. It needs to be transformed in some way through teachers and in the schools.

It is serious business we are in. The welfare of our nations depends on it, as does the betterment of our schools and our societies. If we are to accomplish any reform and make our schools more effective, we must work with the teachers in the schools. If we ever needed people who can exercise the continuing application of intelligence, that Bob Howsam talked about years ago, it is today. Our societies depend on it.

Research in Teacher Education: New Emphases in the Information Age in Italy
Panelist's Comments

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As a general introduction, I want to underline that my purpose is not a simple exercise of social forecasting. The experience of the last 20 years gives us the awareness that accurate social forecasting is quite impossible. Society is the result of an enormous number of day-by-day transactions, linked often to the irrationality of feelings rather than to the rationality of reason. Thus, realistic prediction is only a theoretical exercise, or a kind of projection on the future of our wishful thinking.

In this view, and also considering the increasing complexity and autonomy of our societies, my first assumption is that the only possibility to intervene in society is linked to the use of what I define as "soft levers." The governance of our society is possible if we try to adjust its direction through the use of gentle persuasion and delicate suggestion. Among these soft levers, one of the most important is the combined effect of education, educational research, and tertiarization on the society as a whole. It is essential that the researchers' way of thinking and the researchers' attitude pervade the whole educational system, not only the university. At the same time I consider the realization of this attitude as a main task of the university.

Tertiarized society does not only mean a society of services but also a scientific society. In fact, my idea of tertiarization is not the well known trend of society to the services, but also the application of the industrial way of organizing the production of goods to the whole social system.

The second point of my analysis is connected to the different situations of the labor market in the United States on the one hand and the European countries and the rest of the world on the other hand. The trend in the United States labor market confirms the following assumption coming out of one recent report discussed in the American Congress related to the informatics society and its consequence in education. The assumption is this: the future of the labor market is showing a new phenomenon; we may call it a break in the middle and an unbalanced emphasis at the extremes. If the future labor market in the world evolves like the American market, then we are entering a new society in which we will have a few medium level jobs, an increasing number of sophisticated ones, and a lot of low level jobs. The consequences of this deep change is evident: a sort of polarization of future society in which a new elite will be dominant, and the middle class of today will fall into a large size lower class.

A further assumption has to do with the role of the educational system in this changing aspect of our society. It is evident that the strong, deep links between the school and the economic system will last. The relation between the school and the economy focused on by OECD since the well known conference in Washington D.C. in 1961, and confirmed last year in a similar conference in Washington, will not only remain but it will perhaps become even more important, but in a framework that is different from the recent past. The educational system will be called on to prepare the new, very advanced elite of the computerized society, and the humanities will play an important role in this challenge. As this elite is developed, the mass university of the 1960's will change. The universities will play a different role. They will have a prominent role in the diffusion of science in society instead of their traditional role of creating science. In a sense, we shall go back to the university of the last century, when the university was intended to prepare the ruling class, and only the ruling class.

The university for all will disappear. It is already disappearing. actually. In this framework, we wonder what will be the role of the other parts of the educational system and of the teachers involved. I think that we are moving towards a polarized school system, reflecting the division of the coming society. I want to say that on the one hand the large size compulsory school system, for from 3 to 16 years of age, will meet the basic needs of society and individuals. We can find here, like in the labor system, the structure that will give everybody the basics for living as worker and citizen in a complex society. It also will be true that the skills provided by this basic school will be much more than those required by an economic system which does not need a large number of qualified workers.

The main problem of the coming informatics educational system concerns the segment between ages 16 and 24. The high school and university level will "softly converge." Nowadays, the best upper secondary school in Europe does not only produce very qualified personnel but it also uses high standard teachers who at least in my country sometimes also give lectures in universities and produce creative research.

On the other hand, as I just pointed out, the mass university will lose its ancient role and will be limited to the preparation of the middle level personnel. This will be the school for the future upper class, for which a general preparation will be required in order to gain both professional skills and a wider understanding of the main problems of the future. The third level of the new university will be devoted to the preparation of the new elite of the computerized society. I want to underline that I am not in favor of this kind of stratified society. I fear that we are moving toward such a society despite our personal intentions.

I will conclude by recalling the example of industrialized society connected to education. As you know, industrial society means or has meant big firms, big towns, lots of standardized goods. It is or was a mass society. After the 1960's, this situation has changed. From the big we have passed to the ethics of the small. Small is beautiful.

The Taylor line production model for producing cars has been replaced at this time by the new way of producing them. Now, the informatics revolution is changing also, moving toward an industrialized society which is big again, but which can produce very small and personal items. The symbol of that in Italy is the Fiat Uno car. This is a product of the most highly computerized firm in Italy. As a consequence, society is much more free and rich than in the past. But to enjoy its possibilities, we need a more educated, open minded society with a prominent international attitude. And this is an additional task for the school.

A few days ago, the French Minister of Education, speaking at an international meeting, said that encumbering the school with a lot of new tasks and responsibilities is not right. My opinion is to the contrary. Within the school, we face the challenge of the future as a whole, and we can not avoid the tasks and responsibilities that are only ours.

ABSTRACTS
OF CONCURRENT SESSION PRESENTATIONS

Research and Innovations in Teacher Education in the Information Age

A Case Study of a School-Based Change (Chowdhri, Shaheen, Quaid-i-Azam University, Islamabad, Pakistan) SP026771

A micro-level project was developed in Pakistan to decrease the number of school dropouts. The program was tested in two rural primary schools by introducing three new types of activities: (1) body movement and educational games; (2) teacher training; and (3) community involvement. Teachers were trained at the school where they worked. After classroom observations were made of teaching activities and behaviors, events were reconstructed for teachers so they could see both the problems and possible solutions of the events. School principals and higher level administrators were also involved. The program has resulted in less strict regimentation in the classroom. Teachers have shifted their emphasis from rote memorization to understanding of concepts and have also become more organized in their teaching tasks. More freedom of movement and speech in classrooms has been observed. The author concludes that the hidden curriculum of staff and the "laissez-faire" attitude of administration and the school community maintained the previous problems experienced at the school. The school-based change program offered many solutions to these problems.

Distance Teaching and Learning: A Case Study (El-Meligi, Helmy, University of Alexandria, Shatby, Egypt) SP026779

A description is given of a distance education program designed to up-grade and complete the education of teachers in Egypt, the majority of whom have not completed their education through the university level. Television and other audio-visual aids are used as communication media. Educational programs are televised daily to these teachers. Though educational technology has proved to be extremely useful, these advanced aids are not considered substitutes for the human teacher. Therefore, meetings with university professors and lecturers in regional study centers for discussions on different subject matters are a part of the program. A model of self-training activities is included and conducted in different study centers located in critical geographic sites. After practicing the model activities, the teachers' initial passivity and indifference have changed to active participation, and they have become involved and highly interested in the activities. Evaluation of these activities shows the outcome of feedback and indicates changes in the teachers' role conception.

Outreach in Teacher Education to Peripheral Areas of Guyana: A Case Study (France, Lynette, University of Guyana, Georgetown, Guyana)

The potential and problems of outreach programs in underdeveloped nations are discussed. Evaluation is made of a program designed to provide university services to populations unable to attend the University of Guyana. The program was a series of workshops designed for teachers. Topics include lesson planning, student activities, demonstration exercises, and unit planning. Recommendations for improving on the workshops are presented.

American Education: Implications from the Information Age (Gardner, William, University of Minnesota, Minneapolis, Minnesota, U.S.A.)
SP026756

This paper considers the needs of future educational systems in an age of information. Characteristics of such systems are described and analyzed. "An information age educational system, then, would stress the big picture, be experimental, emphasize skills and tools of thought and action and extend throughout life. It would have alternative delivery systems utilizing cable, microwave, satellites, and low power television. It would enhance school curricula in rural areas by using interaction video-telecommunications. It would develop distance learning systems involving in the same class or the same course such diverse groups as high school students, factory workers, prison inmates, and the general public. It would, in short, use any and all of the information technologies as creatively as possible to change the way we teach and learn."

Innovation, Teachers and Educational Technology (Maia, Nelly Aleotti, Federal University of Rio de Janeiro, Brazil)

The use of educational technology today in developing countries is a series of questions rather than statements. The most frequently asked and the most striking questions are addressed in this brief presentation: (1) What is the role of educational technology in the developing countries? (2) How do teachers respond to educational technology? (3) How do administrators respond to educational technology? (4) Is educational technology a response to a real need or is it merely a fashion?

Research and Information in Teacher Education in the Information Age: Perspective from the Caribbean (Miller, Errol L., The University of the West Indies, Kingston, Jamaica)

> The impact of the Information Age on teacher education in the Caribbean is discussed. The Caribbean nations have undergone a great deal of change in social, economic and cultural areas over the last few years. Demands for improvement of education must be dealt with as well as other equally important demands that are made. Areas which need to be addressed in relation to the Information Age include schooling and the labor market, teacher supply and unemployment, curriculum reform and teacher training.

Technological Resources in Peruvian Education (Pajuelo, Maria Marta, Ministry of Education, Lima, Peru)

> Technological resources used by school systems in Peru are detailed. The use of radio for education is the most important of resources; radio is currently being used to fight illiteracy and to provide adult education often to rural or poor populations who did not previously have any access to educational resources. Tape recorders, video materials, and trucks to transport this equipment are also being used to reach all populations in Peru. Television has also been used since the 1960's to promote literacy and provide community and agricultural education. Teacher training programs in Peru also use television and radio. There are correspondence course programs to supplement regular teacher training programs. Some problems still exist with the scarcity of some teaching materials and other resources and for transfer of technological resources.

Teacher Education Research in India: Its Emphases and Impacts (Singh, S.P., Avadh University, Gonda, India)

> The importance and contributions of teacher education research in India are discussed. Current research analyzes and evaluates prevalent teaching thought and practices in India. Research also attempts to generate new knowledge and alternate strategies for teaching. Teacher education research in India has paved the way for reviewing and reexamining teaching goals and have given insight to the content, models and structure of teacher education. Research has also provided perspectives into the systems and methods for learning and teaching and has helped in the development of evaluation processes and techniques. Most importantly, teacher education research in India has provided clues for solving the problems that India has experienced in its education system.

A Model Teacher Training Program for Improving Second Language Proficiency and Scientific-Technological Literacy (Sutman, Francis X., Annette Lopez, Cynthia Bilotta, and Mark O'Shea, Fairleigh Dickinson University, Teaneck, New Jersey, U.S.A.)

A program offered at Fairleigh Dickinson University to prepare teachers to use science technology activities to improve second language development is described. When such hands-on activities or investigations serve to introduce language lessons, the achievement in language is far above that when taught by more traditional methods. This presentation discusses several aspects of the program, including: (1) goals and objectives of the science/math teacher training program; (2) cultural implications of learning styles to the instruction of limited English language populations; (3) sample science/math/language activities; and (4) implications of this approach to improvement in second language learning.

SECTION V

Current Developments in Education in the Information Age

Implications of the Information Age for the Teaching Profession

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and
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How could I, a classroom teacher from a fairly ordinary suburban Canadian high school, possibly hope to address this topic? As I thought about it, the outlines began to arrange themselves. As a teacher, I know from experience how the computer revolution is affecting me, my colleagues, and my students. Perhaps I can speculate on how the education system, and even society, are evolving. Using my own district as an example, I hope to show you where we are, how we got there, and where we might go in the future.

Teachers work within many contexts. We have our classrooms, within which we more or less control the flow of events. We have the physical school context, with its rules and regulations which affect our teaching situation. We also work within the context of our students' lives, often moving blindly in situations we know nothing about. We operate within our community, and are affected by the ethnic and racial mix, the socioeconomic status, the transience or permanence of its residents, and even the level of commitment to sports within the community. Lastly, we operate within the context of our society at large. The overall economic situation, awareness of nuclear threats, the political party in power. All affect our lives and, often quite directly, our work.

Technological change, also, operates within contexts. As we are affected by the contexts within which we teach, each of those contexts is in turn affected in a variety of ways by technological change. The one given about the Information Age is that it is not simple to live in. From the optical scanning forms we now fill in for report cards, to the student whose father is on unemployment as a result of the mechanization of a factory, technological change reaches into and affects every aspect of our working lives.

Before we can look at how the Information Age is affecting schools in Delta, where I teach, we need a framework within which the details of our progress will make sense. The popular current phrase to describe the impact of the Information Age on society, and specifically on the work we do, is technological change. What is technological change? What are its components? Elaine Bernard, Director of the Labour Program at Simon Fraser University, describes technology as "the means and processes used by us, society, to create the products of our existence." She identifies five components of technology: tools, materials, energy forms, techniques, and organization of labour.

Tools are the implements which fashion our labour. Within the Canadian school system, our tools range from blackboards to textbooks, from microcomputers to pencils. Our raw materials are young minds. Our energy form is usually simple human physical and mental exertion. It may occur to you that these items are not changing; that technological change has not really affected our tools, our materials, or our energy forms in any significant way at all. Indeed, on the surface, today's schools are relatively unchanged. Walking down the hall of my daughter's elementary school, I see the same colourful bulletin boards filled with children's efforts that I remember from my youth. There may be a computer in the back of the classroom, but the appearance of the Canadian education system remains basically as it was 20 years ago.

It is in the last two aspects of technology, those of teaching techniques and organization of labour, that profound and sweeping changes are underway. Teaching 16- and 17-year-olds in a modern secondary school requires an innovative teaching style. Today's television generation does not accept the lecture format with any comfort. They expect to be entertained, and I do not say this negatively or with any resentment. At the same time, many students find an interactive style uncomfortable after years of passive pastimes. Add to this students' growing alienation and sense of hopelessness. They know that job stability is probably a thing of the past; that there is no simple comfortable future waiting out there after graduation. The result is an increasing demand on educators for teaching techniques which are flexible, positive, informative, and entertaining.

Is our labour being reorganized? Probably not yet. We still work in schools with staffs and principals. We belong to teacher unions or organizations. The implications of the current industrial trend toward centralization and deskilling have not really had an impact on my school yet. But it is important to realize that a change in any one component of technology affects the other aspects of technology as well. As satellites, global communication, and networking become commonplace, we must anticipate and prepare for attempts to reorganize, perhaps to deskill and dehumanize, our work. Technological change is not just the introduction of computers into everyday life. Any alteration in tools, materials, energy forms, techniques, or organization of labor ripples through our work with profound and sometimes unanticipated results.

In addition to having identifiable components, technological change also follows a chronological line. The first stage is the introduction of machines or materials or techniques in isolation. The use of optical scanning for report card production is an example of a technique in isolation. The second stage is convergence. At this stage the individual innovations are no longer in isolation, but are linked in a cohesive system. In today's offices, the data processor, word processor, telecommunications, and facsimile reproducer may be linked through a Local Area Network. Coordinating curricula related to technology is a topic in education in Canada today. The final stage of technological change is consolidation. At this stage the new technology is taken for granted; only the old-timers can remember "how we used to do it." Perhaps our children will wonder how we ever survived without interactive global computer and telecommunications networks, just as we may wonder what our parents did before television.

In the North American society, the Information Age is at the middle stage. The convergence stage is a time of flux, of tension, but also a time of possibilities. If technology is not following the optimum path, as many suggest, if it is being used to dehumanize rather than to enrich labour, the possibility of change is still open. As educators, we need to study, to discuss, and to propose ways to ensure that technological change will be used to benefit the human beings within our education systems.

Enough of these weighty topics. Let me tell you a bit about Delta, where I live and work. Delta is a suburban community, mainly residential, with a population of around 68,000. It takes me 40 minutes to get from my house to downtown Vancouver, so the delights of civilization are not too hard to access. There are about 950 teachers in the Delta School District, working in 25 elementary, 4 junior secondary, 2 junior/senior secondary, and 2 senior secondary schools.

I teach at North Delta, a senior secondary school. The school has approximately 1,200 students, all in grades 11 and 12, which is about 100 more bodies than the building will comfortably fit. There are about 72 staff members at my school. North Delta prides itself on being a school for everyone, with high academic standards and well-developed and successful business and vocational programs. Our daily schedule is designed to accommodate returning adult students. We have an arena scheduling system which at least in theory allows students to pick their own courses, times, and teachers. The students themselves are fairly hard-working and generally respectful, and the parents are very supportive.

Now let us observe the arrival of the Information Age into this quiet, middle-class school. Delta has gone through three stages, roughly corresponding to the three levels of technological change. First came the wizard stage, with isolated computer use. In 1972 the district purchased a Digital PDP 4, and then two PDP 8E's. These computer systems were presided over by one enthusiastic, male teacher in each school. They were used exclusively for computer science courses, which were taken almost exclusively by boys. Other schools could use the computers by having students fill in mark-sense cards. The cards were then taken to the central school and run through the computer in a batch. We lived through all the old cliches about spaghetti code, computer gurus, and student hackers. This stage lasted until about 1980. One significant advance during the period was the introduction of Data Processing, a business oriented course, running parallel to the Computer Science course. This brought the computer closer to the mainstream of the school, as secretarial and accounting students, often girls, began to work in the room with the "science types."

In 1980, the provincial government announced the JEM pilot project, designed to test the use of Apple II computers in the schools. One hundred computers were bulk purchased and districts submitted project proposals to the ministry for approval. Delta received 9 computers, of which 2 came to North Delta, my school. The computers were used in conjunction with the PDP system, and gave the students a chance to try interactive programming. Until 1983, we used the two systems, one batch and one on-line, to teach students in Computer Science and Data Processing how to write programs using the BASIC language.

In 1983, Delta purchased an additional 20 Apple II computers. These computers were placed in the elementary schools, with each receiving at least one. From there, things began to snowball, and we went into the second stage of acquiring additional equipment. In September 1984, the district had 51 IBM PC's in secondary schools, and over 60 Apple computers, mainly in elementary schools. There were also an estimated 25 parent-purchased computers in Delta schools.

Economic restraint, coupled with a natural inclination toward rationality, has led to a slowdown in the purchase of hardware. Rather than demanding more and more machinery, teachers are requesting guidance and training. Three years ago, we said "Just give me computers and I'll work miracles for you." But the miracles did not always follow. Now, more and more educators in Canada are looking for appropriate uses of technology. We are starting to demand that the technology be used to promote and enhance the principles of learning that we have always believed in. We are looking for a convergence between our ideals and goals in learning and these new, powerful and seductive tools.

Delta's progress of acquisition was not as haphazard as I have perhaps made it sound. In fact, the value of the current computer program stems from our agonizing over every step along the way. An early and influential decision in Delta was to recognize the power of the decision makers in the district. An initial 15 hour inservice course of computer familiarization was first given to all district staff and principals. Attendance at the course was compulsory, and resulted in a local school decision process based a little more on knowledge and a little less on speculation. Teachers were then offered the course on a voluntary basis, and over 400 had taken part before provincial restraint policies led the district to cancel the program. During the sessions, teachers were shown ways to use the computer to help with the clerical tasks of teaching. Word processing and marks gathering programs were introduced. Shorter inservice sessions were also offered to parent groups at various schools.

At the same time, computers were also being introduced into school offices in Delta, with the ultimate goal of centralized record keeping. Many hours of preservice and continuing support have been available to district secretaries. The secretaries' work is now both more productive and more satisfying for them. However, the centralization of records raises as yet unanswered questions of security of information for both teachers and students.

At the school level, educators in Delta have reached only a few conclusions thus far. Our early contention that two students per machine would be an optimum number has been confirmed in practice. It is important to maintain child to child interaction, as well as child to machine contact. The introduction of microcomputers also leads to an increased need for relaxed, pleasant surroundings. The high technological atmosphere can best be countered by high touch, friendly, personal teaching. Our final classroom based conclusion is that no single arrangement of computers is inherently superior to another. One computer in a classroom may work very well, or may be totally ineffective. Care must be taken to find the arrangement which best suits the teacher's style and best promotes active learning by students.

If I were to give advice based on Delta's experience, it would be three-fold. First, set limited, realistic goals. As any successful entrepreneur knows, too many new initiatives all at once will sink even an established enterprise. Self-preservation dictates a narrow focus and very conservative time lines. If you expect to spend one million dollars, and to take 2 years to achieve your goal, budget for 2 million dollars, and allow for 5 years. Second, get the decision makers on your side. Teachers from around the province voice again and again the importance of having a supportive, knowledgeable principal. There's a delicate balance between sowing interest in technology, and reaping frustration over lack of equipment. Obviously, you have to have machinery to implement programs. But often the equally pressing need for teacher time to learn, to plan, to synthesize, to integrate new and old, is overlooked. The greatest problem facing British Columbia schools right now is the erosion of teacher time and energy. Support, communication, and coordination are the keys to successful implementation of any technology.

Is Delta a typical district? I think so. Listening to teachers from all over British Columbia, the pattern is fairly consistent. A few districts are still at the wizard stage, with a single enthusiastic teacher leading the way. Most have passed through a heavy purchasing phase. According to the British Columbia Teachers' Federation Microcomputer Survey, in June 1984, the ratio of students per computer ranged from 14.4 in Nisgha, a heavily federally subsidized district, to 154 in Kitimat. The provincial average last June was 76 students per computer.

A year and a half ago, the British Columbia Teachers' Federation (BCTF) initiated the Task Force on Microtechnology in the Schools. The Task Force has consistently maintained an issue-based focus, rather than a how-to-do-it approach. Another branch of the BCTF offers province-wide practical inservice sessions for beginning computer users, stressing teacher uses of software. Last March we held our first provincial conference, with representatives from almost every district in the province. The concensus of the participants was overwhelming; teachers want guidance, support, and communication systems. They express cautious optimism and a willingness to search for appropriate educational uses for technology. Teachers in British Columbia are ready and eager to talk about the sometimes thorny dilemmas technology can bring.

Across Canada the outcome is similar. Some provinces have elected to standardize both machinery and instruction. We all know that in Canada British Columbia is a backwater for educational funding and leadership. At the Technology and Education conference in Montreal this spring, I heard the same concerns aired by educators from across Canada. It is time to seriously consider what we are accomplishing, what and whose hidden agendas we may be following, and most important, what is best for the children in our care?

What are some of the issues surrounding technology today? One is fairly straightforward, and yields at least potential solutions. In the race to acquire computers, many schools have totally ignored the machine's surrounding environment. Four thousand dollar machines sit on 30-year-old tables, with rickety metal chairs, inadequate and often glaring lighting, and wires running everywhere. I am describing my own laboratory, in my own school, and actually it is pretty good compared to many. We have adjustable keyboards and lots of windows for fresh air. We have tried to arrange the video display terminals to minimize radiation hazards. And at least all our students are roughly adult size. The difficulties mushroom in an elementary setting with roving computers and children from small 5-year-olds to full-grown 12-year-olds using the same furniture.

We need at least provincial, preferably federal, standards for the physical operation of computer equipment in schools. Many studies of ergonomics have been done, although work remains scant in the area of children's bodies. The government must establish guidelines and provide funding to protect the backs and eyes of both today's teachers and tomorrow's generation. The whole question of video display terminal radiation and its effects on children's mental development and eventual reproduction are too uncertain to be left to chance. We need immediate regulations which err on the side of caution.

Another human need which must be addressed is the mental and emotional welfare of computer users. Sherry Turkle, in The Second Self, writes eloquently of the human/machine interface. The apparent intelligence of these awesome machines leads us to ponder our own nature. Nowhere is this more evident than in children. We as educators must support their natural curiosity and bolster their sense of self-worth. Perhaps if we listen actively we can catch the echoes of future philosophies.

On a more mundane level, the introduction of new technology can be very stressful. My younger daughter is five; she reacts very negatively to the competitive, shoot-em-up attitude of most computer games. This early stressful introduction may prejudice children against essential learning of later years. Teachers often react similarly to perceived pressure to use technology in their classroom. They feel out of touch, left behind, and yet very hesitant to step into what may well be a new role.

One key to dispelling their stress is to place the user totally in control of the machine. My daughter loves games which move at her pace, not the machine's. A teacher given opportunities for ample training and choices of whether and how to use technology is much less apt to feel undue stress. The user must be given an active voice in designing and using any system.

I spoke earlier of teachers' eagerness to search for appropriate uses of technology. To do so, we must ask ourselves three questions. What am I trying to accomplish? Could a computer help me do it? If so, how can I best use the machine to achieve my goal? If the goal is increased written communication skill, then word processing applications may be very helpful. If the goal is improved map reading, then a "Journey Through the Neighbourhood" might be more appropriate. My point is that the learning outcome comes first. Then the machinery can be considered as one of several options for achieving the desired result. Lastly, if we choose to use the technology, we must tailor that use to our goals. The danger lies in adapting our beliefs and goals to what the machine can do. As consumers, it is all too tempting to step into this trap. As educators, it is essential that we avoid falling in.

Another issue with widespread ramifications is equity. No one in this room worries about the equity of pencil use. Why? Because we have plenty of pencils. Problems related to equity of computer use all stem from a lack of supply. As long as we have too few computers, we will have to make hard choices of who gets to use them. In Canada today there are glaring inequalities of students per computer from province to province. In British Columbia, there are vast differences from district to district. Within a district, some schools have many extra parent-bought computers, an active staff, and enthusiastic participation among students. Other schools have one district-mandated machine sitting forgotten in a corner. The only solution to these massive inequalities seems to be adequate government funding. If the computer has become an essential tool in the classroom, it must be provided equitably to all students.

Equity dilemmas often strike even closer to home, within individual schools and classrooms. Is it important that boys and girls have equal access? What if the girls are not as interested? How can we motivate them? Better yet, how can we change the technology so that it will be meaningful to women? Should handicapped students have priority access to limited equipment? What about gifted children? What about teachers? Does their need for training supercede the students' need for access? There are no simple answers to these questions. We are, after all, in a stage of convergence, of flux, of choices, and those choices will shape our children's future. To move blindly on without acknowledging the existence of problems would be foolhardy. We must concede these issues, talk about them, worry about them, and make decisions based on our beliefs and goals.

Let's turn now, briefly, to what lies ahead. What will be tomorrow's issues? The future holds a special challenge to educators. As workers, we must harness technology to enhance our jobs. We cannot afford to sit by and watch as increasing centralization and control strive to create the "teacher-proof" school. As professionals committed to youth, we must try to prepare our students to meet the challenges ahead.

At the Montreal conference I attended this spring, Gary Watts, an executive of the National Education Association of the United States, described two possible trends in future education. He spoke first of a high technological future following the current industrial trend toward centralization of control and deskilling of work. With computers as the primary instructional device, the teacher becomes a machine technologist and monitor. Such a shortsighted and narrow view of education is nonetheless seductively cost-effective and measurably productive, if one measures productivity through multiple-choice exams.

Watts then presented an alternative child-centered, rather than machine-centered, vision. The computer is a promising tool, and can be efficiently used to convey data to children and to manage the learning environment. By using technology for flexible classroom management, the teacher can concentrate on the synthesis and application of information by students. As workers, educators must monitor closely which tasks are chosen for machine replacement. By reducing the clerical and rote-learning workload, technology can enhance, rather than deskill, the teaching profession.

We must prepare today's youth to find success in the world of the future. Students in kindergarten this year can expect to live well past the middle of the twenty-first century. Their working lives, if the present employment situation continues, will be roughly from 2000 to 2040. What kind of work world will they be entering?

Milton McLaren mentioned some labour statistics when he spoke earlier in this conference. He mentioned the prediction that by the year 2000, there will exist 20 million fewer U.S. jobs than in 1978. That is the whole population of Canada! In Montreal, I had the pleasure of hearing Harley Shaiken, author of Work Transformed: Automation and Labour in the Computer Age. He made some provocative observations about our work today. In the U.S., involuntary, part-time employment has already risen 170 percent in the last 12 years. This increase tends to mask the true unemployment picture, as many are now chronically underemployed. The work that does exist is unevenly distributed geographically. In the spring of 1985, California school districts held employment interviews on British Columbia campuses in an attempt to lure qualified teachers to the state. Heather Menzies, author of Women and the Chip, points out that women and young people, traditionally a marginal labour force, are often hardest hit by under- and un-employment. We must accept that the quantity of work is decreasing.

Is it possible to predict what kinds of jobs may continue to exist? Shaiken cites the following statistics. Clerical work is predicted to decline from 18 percent of the workforce in 1978 to 11 percent by 2000. Also important is that increased demand no longer equates with increased employment. From 1979 to 1984, the U.S. automobile industry sold 6 percent more cars, but employed 23 percent fewer workers. Through centralized control, Boeing Aircraft now employs one-third fewer engineers in total, and 80 percent fewer manufacturing engineers. No longer can any job or type of work be considered secure.

Why do I mention all these facts and figures to you? First, because I believe that we must understand the employment difficulties that will be facing our students. They are already aware on an intuitive level that jobs are hard to get, that there is a two-year waiting list to get into post-secondary vocational training, and that their parents do not have much money to help them out. Secondly, we must not mislead them by pushing training on them which will lead to only very short term employment; I am thinking here mainly of girls who see word processing as their guarantee of future stability.

How can today's education system best prepare children to meet the challenges of the future? Clearly, specific skill training is quickly outdated and ultimately unproductive and frustrating for the student. A heavy emphasis on mathematics and science in isolation would be equally inappropriate for the majority. Students do need to develop their ability to reason and to communicate over a broad spectrum of subject areas. Levin and Rumberger, in a report for the Institute for Research on Educational Finance and Governance at Stanford University, state the case succinctly: "Since we cannot predict in any precise sense which jobs will be available to particular persons, which jobs they will select from those available, and what the characteristics of jobs will be over a forty-year working life, it is best to provide students with a strong general education and an ability to adapt to a changing work environment."

In an era of under- and un-employment, people need increasingly to find success in their lives rather than solely through their jobs. More than ever, students need encouragement to explore and develop a wide variety of talents. A love of learning is no longer a privilege for a small minority. It has become an important asset for the majority as retraining becomes an ongoing process.

Perhaps most important of all, today's students must learn to examine critically the coming advances in technology. Computers can be used to centralize and dehumanize organizations or they can be used to enrich work and give flexibility and independence to workers. Choices are made by people, not machines. Every society will need knowledgeable, critical thinkers to make proactive decisions to use technological change to achieve social gains.

Teachers today, and even more tomorrow, face a dual challenge to preserve and enhance their own work, and to prepare their students for whatever future awaits them. Teachers must make careful, informed choices about technological innovations. At the same time, teachers must continue to press for a broad general education for all students.

Let me conclude by returning to the idea of context. We all, from every nation, are drawn here together today by a single concern, a single motivation: the welfare of the children in the world today. Using that concern as our sole criterion, I urge you all to take my remarks and fit them into your own context. If you, the educators of the educators, are not looking out for the children, who will?

Implications of the Information Age for the Teaching Profession
Panelist's Comments

Aliu Babs Fafunwa
Former Deputy Vice Chancellor
University of Ife, Nigeria

The teacher of today faces greater challenges than the teacher of yesteryears. Classroom management has become more complex. Today's teachers, to be effective, have to extend their activities beyond the classroom and the school compound, for the world of today's child has wider horizons than, for instance, the world of Plato and Aristotle. The twelve-year-old child of today has a vocabulary larger than that of these learned men, for we now live in a world of gadgets, books, radio, television, space travel, electronic computers, test-tube babies, solar energy, and microwave devices.

Let me cite a few examples to illustrate what I mean. Recently, a teacher was teaching arithmetic to a class of seven-year-old children. It was a boring session for them, and when it was time for a break, the children were happy to be out in the open air. About five minutes later, an airplane zoomed past over head. Two of the children started to argue about whether the plane that had just flown past was a Boeing 747 or a DC 10. They entered into serious argument, each describing in detail the characteristics of a DC 10 and those of a Boeing 747. They were still going strong when the bell rang. The first child then turned to the second in disgust and said, "Oh well, it is time for 2 plus 2 again." Indeed, these two children had done space science during their ten-minute break, while their teacher was still helping them at the 2 plus 2 level!

What Is Education?

Oftentimes teachers, educational planners and administrators are so engrossed with the bureaucratic aspect of education that they tend to forget what education is all about. Just to remind us, education broadly defined, is the aggregate of all the processes by means of which a person develops abilities, skills and other forms of behaviour of positive (and sometime negative) value in the society in which he lives. In other words, education is the totality of experience. Schooling is only a part of the educative process; indeed, more formal and informal education takes place out of school than inside.(1) As one author observed:

> Whatever the speed and the scale of achievement of traditional structures might be, schools, universities and institutions can no longer meet the strain. . . . The work of education will have to be pursued well beyond the school-leaving age to ensure the spread of knowledge and the types of training that individuals and societies will

> increasingly require. Such action can only be envisaged through large-scale recourse, beyond the traditional functions of education, to all the vast modern media for spreading knowledge and providing training.(2)

Considerable educational expansion has taken place in Africa in the last twenty years and more so in recent times. Let us take Nigeria as an example. In 1960, Nigeria had two universities with barely 2,000 students; 315 secondary schools with 60,000 students and 14,000 primary schools with 2.9 million pupils. Today, we have 23 universities with a student population of 110,000; over 4,000 secondary schools with 2.5 million students; and more than 40,000 primary schools with 15.8 million children. A similar expansion has taken place in other countries in Africa. With this phenomenal expansion, facilities, staff and equipment have been stretched beyond their elastic limit. Primary school classes in some countries, including Nigeria, have 40 to 60 pupils per class.

This rapid educational expansion has implications for the teacher, the school, the home, and the community at large.

The Challenge for Teacher Education in Africa

The challenge for teacher education in Afria is coterminous with the challenge of African development, with particular reference to the socio-economic, political and cultural imperatives. Africa is second to none when it comes to the rapidity with which change takes place. Africa's teachers, more than any other professionals, stand at the apex of this great change. Consequently, teacher education in Africa should be basically related to every phase of African development, for wherever we turn in the social, economic, political or cultural spheres, we are faced with the recurring problem of the need for trained manpower. No adequate training can take place without competent teachers.

Development is related to productivity, and productivity is a function of education.

> Productivity, the measure of the efficiency with which a nation's resources are transformed into commodities and services, is not simply a function of the amount of manpower, raw materials, capital, and equipment available and in use. Productivity also depends heavily on the attitudes, knowledge and skills of people, which in turn reflect the education, training and complex organizations which modern technology requires.(3)

It is not an accident that certain countries are considered to be developed and certain other countries are under-developed or developing. Human factors, such as attitudes, skills, incentives and aspirations, and other factors, such as shortage of technical and skilled labor, poor management, poor planning and gross underutilization of available manpower, can make a difference. Africa needs different categories of teachers. The definition of "the teacher" within the African context has to be broad enough to cover all those who impart knowledge and skills in formal and nonformal situations. Consequently, the foreman, the auto mechanic, the manager, and the administrator, need to acquire teaching skills in order to maximize their effectiveness as trainers and on-the-job instructors.

As we know, there are three major ways of acquiring knowledge or training:

1. through the formal "school" system (nursery, primary, secondary and post-secondary or higher education);
2. through the nonformal system (apprenticeships, on-the-job training);
3. through the informal system (learning through vicarious experiences and exposure otherwise known as incidental education).

Most developing countries, including Nigeria, have placed undue emphasis on formal education, which in turn has resulted in the craze for "paper qualifications" manifested in diplomas, certificates and university degrees of all types. Consequently, we have erroneously assumed that only those who go to school and receive paper qualifications are "educated," and that those who do not go to school or who went and failed to receive paper qualifications are "not educated," and therefore not intelligent enough to do the work of those with certificates.

Training does not take place in a vacuum. It involves people, money, and materials. However, there are five essential factors that can affect training output:

1. the quality of the programme or curriculum;
2. the quality of students or novitiates;
3. the quality of teachers and instructors;
4. the quality of equipment or facilities;
5. the over-all management capacity (administrative, financial and physical).

Any of these five factors can adversely affect the quality of training output. But item number 3, the teacher, is the key factor, and teacher education in Africa should be development-oriented, at least for the rest of this century. The traditional approach to teacher training will keep African nations short of trained personnel unless they change their traditional concept of education and training.

In the formal sector, there are three levels at which we educate or prepare human resources for the world of work and leisure:

1. the primary level;
2. the post-primary or secondary level (secondary grammar, commercial, technical and agricultural);
3. the post-secondary level (polytechnics, advanced teachers' colleges, various professional and sub-professional schools and universities).

The informal or non-school sector which seems to be less emphasized in many African countries consists of apprenticeships and on-the-job training.

If African countries are to move rapidly in their developmental tasks, teacher education must be given the pride of place in each country's development plan. Teacher education programs need to be diversified, not only in terms of the first, second and third levels of formal education, but also in the area of nonformal education. To this end, special teaching methods and techniques have to be offered to foremen, supervisors, administrators, engineers, and so on, both in the public and the private sectors of the economy. Indeed, all those who engage in any form of teaching or instruction (e.g., the army, the police, the airforce, the boiler maker, the roadside mechanic, the weaver, or the silversmith) need to acquire effective teaching skills. In this mode, fully 50 percent of African university students, as well as those in other post-secondary institutions, would be pursuing teacher education studies in the varous academic, commercial, technical, scientific and agricultural fields. This we see as the main challenge for African education in the 1980's and 1990's.

The Teacher and the Information Age in Africa

From the various papers presented at this conference, and from other meetings, it is obvious that the Information Age is with us. We are already experiencing information explosion. As one author observed:

> Discoveries of fundamental importance are occurring in all fields of science at an incredible rate. These developments have created a new body of knowledge that has affected all mankind. The computer with its enormous power and speed, has acted as a great catalyst to scientific discovery. It has become an amplifier of human thinking, the tool for complex problem-solving and the repository for huge quantities of the world's data, information and knowledge.(4)

We are now in an age in which the amount of information accumulated doubles every ten years. Consequently, the textbook and the teacher are rapidly becoming purveyors of antiquated information. Moreover, the content of education and the methods of transmitting knowledge are being seriously affected.

History is replete with examples of people resisting change whether in developed or developing countries. Yet one of the principal aims of education is to enable the learner to cope with change. Unfortunately, education has not fared well in this direction. Literates as well as non-literates behave almost alike when new ideas or schemes are introduced. The average teacher is resistant to change. If we therefore hope to effect change, we must start with the educational system itself. As the teacher is the pivot, our effort must be directed at the teacher through preservice, inservice and continuing education programmes. That is to say, the new breed of teachers to be produced must be oriented to development and change. But we cannot achieve this goal unless we first produce the type of teacher trainer who is so oriented. Because, after all is said and done, newly trained teachers invariably teach the way they were taught.

The problem is not with technology or information explosion. The problem is in how teachers handle or manipulate technology and how they use their knowledge and ingenuity to produce the desired result.

The type of teacher that the Information Age requires is one who is:

1. capable of carefully selecting and sensibly using the available technological aids and information for the benefit of students;
2. able to promote and provoke critical thinking;
3. open to new ideas and willing to examine them critically and profitably;
4. flexible, open, and sees himself and his students as a team in common search for knowledge.

Added to the above, the UNESCO recommendation for life-long education, given below, is a useful guideline for all nations.

1. We propose lifelong education as the master concept for educational policies in the years to come for both developed and developing countries.
2. Educational institutions and means must be multiplied, made more accessible, offer the individual a far more diversified choice. Education must assume the proportions of a true mass movement.
3. Each person should be able to choose his path more freely, in a more flexible framework, without being compelled to give up using educational services for life if he leaves the system.

4. Artificial or outmoded barriers between different educational disciplines, courses and levels, and between formal and non-formal education should be abolished; recurrent education should be gradually introduced and made available in the fist place to certain categories of the active population.

5. The development of education for pre-school-age children must become one of the major objectives for educational strategies.

6. Universal basic education, in a variety of forms depending on possibilities and needs, should be the top priority for educational policies.

7. Rigid distinctions between different types of teaching--general scientific, technical and professional--must be dropped, and education, as from primary and secondary levels must become theoretical, technological, practical and manual at the same time.

8. Professional and technical training colleges must be developed in conjunction with the secondary education system. The instruction they give must be followed by practical training at places of work, all of which must, above all, be complemented by recurrent educational and vocational training courses.

9. Efforts must be made in to bridge the gap, still found in all too many cases, between educational establishments and business companies, whether privately or publicly owned, for the latter constitute a key element in the overall educational system.

10. Throughout the postsecondary educational system, structures, subject matter and student-categories must be very broadly diversified.(2)

Implications

I started out by stating the conditions of our school system in Africa. Some of the problems are shortage of trained teachers, classrooms, textbooks, and writing materials. I also mentioned that in many areas, a teacher is in charge of 40 to 60 pupils. The question is, "How will many developing countries cope with the new technology and the Information Age?" A number of experiments are being carried out on the use of satellite communication systems for adult literacy, teacher training, undergraduate programs, and so forth. These hold promise for the future. But there are serious economic constraints. A country faced with draught and hunger cannot afford the cost of television sets or satellite communication systems. Many countries in Africa still import all educational material and equipment from abroad. These include beakers, test tubes, plaster of paris, balances, clamps, clips, cylinders, evaporating basins, aspirators, burettes, crucible lids, filter papers, alcohol, not to mention microscopes and other sophisticated and costly equipment. These pieces of equipment are not only costly but serve as a drain on the poor countries' limited foreign exchange facilities. But better science teaching will be delayed for as long as all this equipment must come from abroad. These materials should be produced locally and be made available to every school; every African child should be able to buy a small microscope for 50 cents and a dissecting set for one dollar.(1)

The challenge that developing countries pose to both themselves and to the developed countries is how to use man's scientific ingenuity for the service of those who can hardly feed themselves, much less produce inexpensive educational equipment and materials for childrens' use.

Conclusion

Science and technology continue to divide the world into two unequal parts. Yet a world divided either by science and technology or by poverty and prosperity cannot endure for long. The answer lies in greater and better international cooperation. There is urgent need for scientists and technologists from developed countries to help their young counterparts in developing countries through closer collaboration and free exchange of scientific information.

But the developing countries must be allowed to establish their own priorities. For example, after 25 years of foreign aid in agriculture in Africa, involving hundreds of thousands of experts and advisors, and billions of dollars, Ethiopia, Niger, Sudan, Chad and many other African countries face the grim reality of famine and hunger today. Both the developed and the developing countries are to blame for this serious short-sightedness. Sending aid to the hungry is a noble gesture, but it will be nobler if these and other countries are helped to improve their agriculture and to reach a level of self-sufficiency. I make the same plea for education.

Our presence at the annual ICET World Assembly is a shining example in international cooperation. I hope that when our colleagues are called upon to assist in educational innovation, they will respond with open hands and warm hearts unconditioned by the dollar or naira sign. What we need in Africa today is millions of microscopes and telescopes at 50 cents each.

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Implications of the Information Age
for the Teaching Profession
Panelist's Comments

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"Implications of the Information Age for the Teaching Profession" is a topic that is timely and worthy of discussion. The role of a panel such as this one is to respond to the address given by Mary Moran and to engage in discussion.

With this role in mind, I share just a bit of my background. I am a former classroom teacher from the U.S.A. who has spent the last five years working as a professional development consultant to the National Education Association and its state affiliates in Oklahoma and Ohio. I have coordinated statewide conferences for teachers on the topic of technology, attended national conferences on the topic, and conducted introductory workshops on the appropriate uses of computers in the classroom. These experiences, coupled with my daily contact with practicing classroom teachers, have provided me with some insight into the concerns that the teaching profession has relative to the impact of technology on the profession.

I will limit my comments to three areas: reactions to Mary Moran's address; recommendations and specific concerns from the classroom teachers whom I represent relative to the implications of technology for the teaching profession; and summary observations about the implications for mankind generally.

The speaker's comments, given from a teacher's perspective, accurately reflect not only some of the concerns of Canadian teachers as they deal with technology but those of American teachers as well. Some very pertinent issues were raised: the need to involve teachers in the decision making process; putting time and money into training personnel; analyzing potential hidden agendas; the need for federal standards which err on the side of caution; the need for adequate government funding; equity and access issues; and the necessity for assuring that applied technology meets the needs of learners.

I have some of the same concerns about these issues. Some of the observations that I will now share are embodied in policy and resolutions passed by the governing body of the National Education Association.

The following resolution was passed by the Representative Assembly in 1981 and amended in 1983:

> The National Education Association believes that instructional technology can be employed to improve teaching

and learning. Before sanctioning such technology, the Association believes the following conditions must be met:

a. Classroom teachers in each school must be directly involved in the initial planning, introduction, and use of such technology.

b. Teachers whose professional practice and responsibility are affected by this new technology must be provided with adequate staff development activities funded by the school district.

c. Classroom teachers must monitor changes in content and format of instructional materials to ensure quality of instruction and curricular coordination. (With the NEA Education Computer Service, teachers are involved in evaluating software production of various companies.)

d. Teachers must be involved in the decision making related to changes in the work load and the responsibilities of classroom teachers as a result of the introduction of such technology.

In its report to the 1983 Representative Assembly, a committee recommended that the NEA endeavor to make instructional technology, not limited to computer assisted instruction, an integral part of teacher education and professional development.

Too often, inservice or professional staff development has been done to rather than for or with classroom teachers. The teacher's role in staff development relating to computer technology is the same as that in any other type of staff development. If it is mandated that teachers use computers, school districts should provide the training.

Regardless of the approach used for staff development, particularly at the local level, teachers should try to include some practical experience with computers in their inservice education.

I would like to describe eight computer issues of concern to teachers in the U.S.A. Mary Moran has already touched upon some of these.

Equity. As with most opportunities in our society, the potential exists for the privileged to have easier access to the benefits of the computer than the underprivileged. The public schools, more than any other institution, will again be looked to as the leader in providing equal educational opportunity for computer learning for all students. John Lipkin sees the public schools taking the responsibility for addressing the equity issue:

> All students, regardless of wealth or other personal circumstances, should be provided with microcomputer education which meets the three criteria of equity: access to

> programs, participation in programs and benefits from programs on a basis of individual interest, needs and learning capacity. . . For the lower-class child, the computer is being used in what has been termed the tutor mode, in which the computer directs the student or acts upon him.
>
> For the middle-class student, the computer is being used in the tutee mode, in which, by contrast, it is the student who is controlling the computer.
>
> It has been suggested that the effect of this distinction in computer use is to produce benefits of a different kind along class lines, with the upper classes cast in the mold of leaders and the lower classes, followers.(1)

Privacy. Data banks provide the potential for computer crime. Computerized data are vulnerable. Unauthorized access to and use of data should be prohibited. Unauthorized persons could get data about a program or person and use it to cheat, steal, or commit other serious offenses. Computers are dumb; they cannot do anything without instructions.

Minorities and Women. As in so many segments of our society, the technological segment appears to be reserved for white males for the most part. (Most people do not know that the first computer programmer was a nineteenth century noblewoman, Lady Augusta Ada Byron Lovelace, daughter of the poet Lord Byron.) Computer access and courses should be geared to all users regardless of race or sex. Computer technology also has implications for the job market for minorities and women in years to come. Women and minorities must be trained now for the opportunities that will open up.

Threat to Teachers. Automation, in the forms of teaching machines, language laboratories, and programmed instruction, has been in the classroom for a long time. Although no teacher has been replaced by a machine, many vendors now are promoting the instructional use of computers as a cost saver, especially in rural schools where courses that are not cost effective because of low enrollment have been discontinued. This approach will be attractive to decision makers with low budgets. Computers will certainly require a role change for teachers, but computers do not have instructional design skills. They are only as creative as people can make them be. Teachers are creative by skill and training. Those teachers who are capable of making computers work for them will use computers successfully.

While some researchers believe "artificial intelligence" will soon equal and someday surpass that of the human mind, Morton Hunt believes that human wisdom will exceed the computers' capacity. Computers are superior to the human mind in their capacity to store data and perform fast calculations, but they cannot think or initiate something on their own. According to Hunt, there are other mental phenomena that scientists say cannot be transferred to a computer: consciousness, values, beliefs, curiosity, and caring.(2) The importance of positive teacher attitude cannot be understated, and it cannot be manifested by a computer. Some scientists believe computers represent no real danger to humanity as long as we continue to make decisions that have moral and ethical dimensions.

Dehumanizing Instruction. Will students lose social skills by spending a great deal of time with the computer? How long can a student sit at a computer terminal without getting bored? These are questions that must be addressed as teachers plan for the use of computers in the classroom. In planning, consideration must also be given to the types of students involved and what is to be taught by way of the computer.

Copyright. Educators who purchase software from commercial vendors should determine if it is legal to duplicate the software for multiple users. Usually, software developed entirely under a grant from a federal agency, such as the Department of Education, is in the public domain. Public domain materials belong to the public and can be reproduced without permission.

If software is copyrighted, it is important to know whether the seller owns the copyright or accepts any liability that arises from its distribution. As more and more teachers become involved in the development of educational software, legal issues concerning ownership and royalties undoubtedly will surface.

Legislation. In the U.S.A. in recent years, there have been several pieces of legislation discussed in the Congress to encourage the donation of computers and other technological equipment to primary and secondary schools by liberalizing the charitable tax deduction allowed corporations for making such contributions. The inspiration for this type of legislation was a proposal by Apple Computer, Inc. to provide free a computer to every public elementary, middle, and secondary school in the country in return for more favorable federal tax treatment.

The NEA believes that the Federal Government has a responsibility for helping schools meet needs created by advancing technology and constrained by limited local and state resources. The NEA also believes that there must be the provision of free training with donated computers to assure that classroom users have the knowledge and operating skills necessary to utilize the equipment in the education of elementary and secondary school children, and there must be provision of sufficient educational software so that the most effective use can be made of the computers.

Politics and Economics. How much of a part does politics play in recent efforts to get computers into the schools? Teachers and other educators should beware of hardware companies bearing huge gifts of computers with nothing more in mind than the tax benefits. Teachers must be aware also that many hardware manufacturers are now in the software business. The gift of a computer may be married with a requirement to purchase software from the giver.

In-depth discussion of these eight issues is not possible here today. However, the intent in raising these issues is to give other nations around the world some insights into some of the implications of technology for the teaching profession in the U.S.A. from the perspective of the National Education Association.

As we explore the promises and the pitfalls, it becomes obvious that some very essential things which can only be done in school, cannot be done by machines. As William Barrett has written: "Human creativity exceeds the mechanism it invents, and is required even for their intelligent direction. . . If we try to flee from our human condition into the computer we only meet ourselves there."(3)

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Teaching in the Future: Three Scenarios

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> Globally, futurists agree that we are in a decade of transition--a decade that will take us from the industrial era into the age of information. The catalyst for this transition is going to be high technology. I do not think there is any question about it. Technology is on the horizon that is going to reshape all the institutions of our society--family, business, government, religion, and most especially education. We have gone through this before, although none of us remember it because we were not alive at the time. We had the same kind of transition from an age of agriculture into the industrial era. All our institutions changed. They adapted and that is exactly what we must do now. (1)

Introduction

We are informed continuously by various modes of communication that our society is undergoing a traumatic change due to rapid advances in technology. Similarly, we are informed that substantial social reforms are occurring to accommodate the social impact of technological change. The majority of the world's population is only vaguely aware of these dynamic forces. Yet, when individuals reflect on their past experiences, they recognize that the world in which they live differs significantly from the one into which they were born.

Many people become anxious after reflecting upon their lives because they suddenly realize how little control they have over their future, the future of their children, and the future of society. This anxiety intensifies after they read McLuhan's Understanding Media: The Extensions of Man (2), Toffler's Future Shock (3), Godfrey and Parkhill's Gutenberg Two (4), and Toffler's The Third Wave. (5) Educated readers are aware of the social, political, cultural, economic and intellectual consequences of the transition from the agricultural to the industrial era. Naturally, these astute individuals ponder on the consequences of the transition from an industrial to an information era. The purpose of this intellectual thinking is to minimize the adverse impact and to maximize the benefits of any changes for their families.

In searching for assistance to cope with possible future contingencies, many individuals turn to their national education system. For over a century, national education systems have been providing the general public of their countries with a variety of educational services designed to assist adults and young children to find productive employment, to be socially responsible, and to develop their unique talents.

At the turn of the century, when national societies were much simpler, schools were able to function very effectively. The focus of instructional activity was the "3R's." The elimination of illiteracy was the principal mission of most national education systems. In many parts of the world, this mission continues to be of primary importance.

As the twentieth century advanced, many national societies became technologically complex and socially diverse. McLuhan's "global village" started to become a reality. National education systems responded to the educational demands of the evolving modern technical state in a variety of ways. The provincial education system of Canada, as an illustration, experienced "alternating or conflicting cycles of "progressivism" and "traditionalism." (6) Generally, however, traditionalism has tended to dominate due to the basic conservatism of education systems. Recently, many people have begun to question whether national education systems, in their present form, will continue to survive since they are responding very slowly to the educational needs of modern societies.

At the Fourth Quadrennial International Intervisitation Programme in Educational Administration (IIP '78), Williams and Powell made the following statement in their address on important issues in Canadian educational administration:

> The question to be faced by school boards, faculties of education, and other educational institutions is that of their very existence: we must ask why this public institution as we have known it should continue. Our answer must not be a mere compromise enforced by the pressures of different vested interest groups. It must be that there are certain services which we alone can provide. (7)

Present demands for accountability are requiring national education systems to address this issue. Proposed reforms may be introduced too late as new agencies offer educational services and as an increasing number of learning experiences become available in the home.

The difficult task confronting national education systems has been put into clear perspective by Kratzmann, Byrne and Worth who note:

> Generational differences, changing life-styles, and limited consensus regarding what constitutes desirable or worthwhile social values make it difficult for the school of today to ascertain or reflect any form of social direction. Increasingly pluralistic constituencies demand a variety of services ranging from a return to the "3R's" to family life education. Within this turbulent and ever-changing social spectrum, a thousand and one subcultures exist, each with its own special agenda for the schools. Given these social circumstances and an obvious lack of unifying ideas or beliefs to guide us, it is not surprising that public education is currently beset with serious difficulties. (8)

A more individualized delivery system is obviously needed to satisfy such diverse needs. In both developed and developing countries, radio, television, computers and newspapers are providing people with a wealth of information in their own homes. A natural extension of this "home delivery" movement will be for many educational services to be offered by modern modes of communication. Illich (9) may witness a drastic change in "schooling" within his life time.

The Home Schooling Movement

Over the next decade and a half, computers will become as common in most homes as radios and televisions are today. Early calculators were expensive, awkward to carry and possessed limited capacity. Consequently, these instruments were mainly used in business, commerce, industry, and postsecondary institutions. Advances in solid state physics increased the capacity of these instruments and reduced their cost so they could be purchased by the general public. Computers will probably be subject to similar technical progress and product marketing.

Recent advances in communication technology have enabled universities and colleges to offer credit and non-credit courses by satellite, teleconferencing, videotape and audiotape. Since September 1982, as an example, the University of Victoria has been using the Knowledge Network of the West to transmit a variety of continuing education courses and programmes to professional groups throughout British Columbia. All these courses and programmes, as one might expect, have been well received by the groups for which they were designed. A survey conducted by Oberg and Murphy (10) disclosed that in the education profession a high demand for off-campus courses existed in many areas of the province.

Godfrey, in Gutenberg Two, suggested that in the near future there would be "all information in all places at all times." (4) Such an achievement would appear to be a futurist's dream rather than a practical reality. But, once computers and modern communication technologies are integrated into unified information systems, a multitude of learning experiences will be available to individuals in their homes. Furthermore, many of these experiences, by virtue of the technologies available, will be designed so they accommodate a student's previous experiences, rate of learning, study habits, and personal routines. Individualized instruction will be available to everyone who has a desire to learn.

The home schooling movement will gain momentum over the forthcoming decade as the benefits of this form of school becomes apparent to parents and students. In the early seventies, Toffler perceived that "we can anticipate a small but significant tendency for highly educated parents to pull their children at least part way out of the public education system, offering them home instruction instead." (3) This is now happening in many countries. Why attend a national school when you can be provided with a more individualized education at home?

Students who choose to study at home, according to Toffler, would probably attend the national school system for social, cultural and athletic activities. The role of teachers, the function of a school, and the organizational structure would alter drastically if this belief came into being. There is a possibility, however, that schools will fail to respond adequately in these areas. Often teachers and administrators consider social, cultural and athletic activities to be "frill subjects." Other agencies in many nations are offering a variety of non-academic subjects during the day, in the evening and over the weekend.

What can we expect in the future in terms of schooling? When responding to this question in the early seventies, Worth stated:

> Expanded communication capabilities in the home will make possible a variety of new approaches to education via computer-assisted instruction, remote problem solving and instructional television. . . educational institutions will tend to become resource and organizational centres facilitating the development of individual and group learning experiences in ways quite different from those of today. (11)

Few educators took notice of this scholar's comments because many of them were beginning to become aware of the "cold winds" of accountability. How to satisfy demands for accountability was creating stress and anxiety within national school systems around the world.

Individuals with vision have foreseen that national education systems in their present forms are quickly becoming obsolete. Godfrey reported that "evolving currently with the implementation of the new technological systems for education, audio-visual communications could transform the home into a part-time school." (4) Similarly, Butler perceived that by 1989 "integrated information and video terminals would become widely available in homes." (12) One must question how schools, where "chalk and talk" are employed to transmit knowledge, can compete with these multifunction computing centres. The new technologies, as Dede so astutely notes, "mark a transition in the content, the shape and the organization of education." (13) Most national education systems are doing too little, too late with modern communication technology.

Presently, expenditures for educational activities are high in many countries. The labor-intensive nature of the teaching profession contributes to this situation. When teaching salaries are high and the teaching force mature, educational expenditures become critical financial issues in national budgets. According to Dede, "if we make intelligent use of these technologies, the real cost of education will decrease." (13) When this decrease in expenditures becomes substantial, national education systems will have difficulty surviving.

At present most children obtain a considerable amount of knowledge from textbooks and written notes provided by their teachers. Both these methods of transmitting knowledge are going to quickly become out-dated when the new technologies facilitate the transmission of data and texts in dimensions of space and time. (14) By the end of the eighties many homes, according to Godfrey, "could be equipped with home terminals capable of utilizing IRTV (Information Retrieval Television Systems) and computerized library systems." (4) With this access to knowledge, students studying at home will read books mainly for pleasure.

One of the major functions of national education systems, especially in western countries, has been to provide parents a babysitting service for their children. Presently, parents in many areas of Canada are forming cooperative groups for pre-school children. There is no reason to prevent similar groups being formed for other age groups. As more and more individuals become employed part-time and others accept early retirement, there will be more than a sufficient number of people available to manage these cooperative groups. In rural communities, and even in some urban centres, senior members of families may once again play a major role in the education of children.

Critics of the home schooling movement often ask how the needs of children with learning difficulties will be met. National education systems, as well as other agencies, will become "resource and organizational centres facilitating the development of individual and group learning experiences in ways quite different from those today." (11) Children with learning difficulties will be provided with special tutorials by consultants at the centres. Similarly, students encountering problems in their studies will telephone a consultant for assistance. A student in the future may dial for a teacher in the same way they dial for a pizza today.

There is ample evidence to suggest that many adults and children through the world will soon be receiving a considerable proportion of their basic education in their own homes. National education systems will lose their present monopoly over education as they are required to share with other agencies the responsibility for educating people, whether they be young or old, for life in a highly technologically complex and socially diverse society. These new conditions will drastically change the role of a teacher which will have important implications for teacher preparation, inservice programmes and the administration of the system.

Countering Adverse Technologies

Not everyone is enamoured of technology. For some people life is more complex and less pleasant since we entered this evolutionary phase. A type of school which one can predict will emerge to counter technologies might have, as its rationale, the following:

> Our technological society is dehumanizing. It has made our cities unliveable; has ruined our wilderness and rural lives. But, worst of all, it has facilitated the militarization of the world. And those who are the least trustworthy--our politicians and generals all over the world--have employed every technological advance to increase the fear in which we live today.

As educators we must counter this. Our children must not grow up in a world that assumes they are legitimate fodder for some impersonal corporation or mindless army. Human beings are, as Krishnamurti has pointed out, extraordinarily violent; and the limitless proliferation of impersonal technologies, that reduce interpersonal interaction and communication, can only serve to foster feelings of isolation and aggression. Furthermore, the human abuse of this planet through highly sophisticated methods, such as strip mining and the developing of agricultural land, provides our children with a view of the world that says it is okay to destroy the forests; it is okay to kill off the animals and it is okay to prepare for the final nuclear holocaust. Technology may be, in its purest form, neutral, but in lethal human hands it will bring closer the day when the human attributes that will finally be extended by technology will be our ignorance and aggression, not our care for this planet or our fellow humans. The truth of all this is clear to see. Americans, Canadians, Europeans and Russians have the technological ability to turn this planet into a paradise. But we do not; we really do not want to. So, let us stop pretending that in the end we will be better off with our technology and let us admit that we are not to be trusted.

Let us admit our intellectual and emotional limits and not pretend that we will use technology wisely. We must use our education system to develop intrinsic human talents; to re-establish human interaction, and creativity; and foster tolerance and peace. We must reject the notion that we are actually improving the quality of life on earth with our technology.

The schools we have and will establish must be seen as products of a technological society. Their purpose will be the re-establishment and maintenance of the following principles:

1. Individual human growth and development is the primary purpose of education;
2. Interpersonal cooperation is the vehicle by which well-developed individuals will learn tolerance;
3. The fundamental psychological change that needs to be brought about inside each one of us can be a reality if we remove definition, labelling, tribalism and fear of defeat from our lives.

How might the school of the future attempt to achieve these principles? The major ways, will be these:

1. Making individual human growth and development a priority. This requires the replacement of the current "Basics" with some new, more relevant ones. Current "Basics" give

precedence to the mastery of symbol systems. New Basics would concentrate on the development of individual human talents: Art, Music, Lateral Thinking, Dance, Mechanics, Technology, Literacy, Mediacy, Health, Languages, International Understanding and Peace Studies will become care subjects.

2. Teaching of tolerance. This requires the development of communication skills; studying war and peace; and incorporating international exchanges and travel into the regular curriculum.

In terms of teacher training, the evolution of such schools would require two major changes: first, the establishment of teaching as a real profession with high admission standards and high rewards, which would encourage the brightest high school graduates to enter the profession rather than the weakest and (according to Coombes) the least secure; second, a truly technological approach to the business of the profession, whereby theory and practice are integrated. English educator Eric Midwinter has complained for years that there is in education virtually no practical link between research and action. Most research is never applied. Most educational practice is conducted without reference to research. If actual human need and struggle became education theory, then the practice of education would be different from what it actually is today in many schools.

In summary, the concern of those who want to counter the adverse uses of technology can be related in the following way:

> Currently, technology extends our predominately aggressive nature. We must develop in parallel with such application a strong process focussing on human growth, philosophical growth, and personal psychological change. It is for this that our schools must primarily exist.

Alternative Schools

Some educators, many of whom are parents and not formally trained teachers, have something to say about education in a technological society. In summary, it is this:

> Technology is neutral. It is part of the evolutionary process--an extension of us: as natural as everything else in nature. We must understand it in order to understand ourselves. But current school systems, have, mainly, very little ability to help us to do this. They are locked into a set of archaic moral and social laws and into a print-oriented information system that no longer reflects actual values and life. They rarely help us in any massive sense to address our critical problems.

> So, to educate our children--particularly our poor children and ghetto children--to deal with the actualities of contemporary life without getting devoured by technology we must take responsibility for their education and start our own alternative schools. We do not want to set up another bureaucratic system. We may network if it suit us.

The schools that emerged in the United Kingdom, the United States and Canada in the 1960's were the first wave of populist reaction to the problems of what Marshall McLuhan called "culture-lag," which is the inability to keep up and stay relevent. There were in 1968 over two thousand such schools. Many were destined not to last long, but that is alright. There is no rule in nature that says things are better for having lasted a long time.

Following is a description by Potter in which some of North America's alternative schools are described. It provides an overview of the wide variety of schools that a technological society produces.

> In Chicago, 350 public school children were enrolled in Metro High School, which offered participative decision-making on curriculum, discipline, and community roles. Philadelphia's Parkway High School, designed by John Bremer (later British Columbia's first Commissioner for Education) offered its urban students "subjects" taught in the workplace: mathematics in the offices of insurance companies, drama in theatres, social studies in the streets, and literacy courses that placed as much importance on a camera as they did on a pen. Pacific High School in Palo Alto, California, made extensive use of film, television, San Francisco's streets, and travel in its curriculum. Students at this school built much of the place themselves, in a series of geodesic domes.
>
> Some private alternative schools reflected rapidly changing urban living conditions. The Newark Community School in New Jersey began when a complex array of social and economic problems left that city's black community with no guarantee that its children would receive adequate instruction in "basic" subjects. The school's definition of "basic" was very different from ours, but reflected parents' feelings that social awareness is critical for urban survival. History, for example, was "The History of Insurgent Minorities" and included units in civil rights and how to handle the police. Other "core" subjects included auto repair, sex education, and drama.
>
> Oakland's New Community School made extensive use of simulation in its social studies classes, trained its students for political activism, offered a course called "Redecorate the City" which incorporated film, photography, and graphic arts, and gave students an "Urban Survival Test" which required them to create a replica of an urban ecosystem.

At the Study-Travel Community School, students lived in yurts. One course required students to make extensive journeys with little money, so that they would learn to identify and use inexpensive resources.

Everdale Place in Ontario and Saturna Island Free School in B.C. both taught economics and ecology through farm management and simple rural living. (15)

Conclusion

What is critically important here is that we recognize that in a technological age a lot of things speed up. The rules change. Life intensifies and so do parents' concerns about the purpose and quality of education. Reactions to technology are inevitable and must be accommodated.

Research in Britain during the 1970's provided examples of Education Authority Directors strongly opposed to emerging free schools, but incapable of developing viable alternatives. American writer Johathan Viozol relates horror stories of the forced closure of ghetto alternatives, the effect of which was to anger parents and put confused and deprived children on the streets.

In British Columbia, where we have terrible problems with our Ministry of education's tight-fisted reactionary attitudes towards Education, bright educational ideas and experiments have been crushed or at least rarely supported.

Technologies intensify and expand our lives, and the prospect of many different kinds of schools is exciting - so long as the constraints that are all too often associated with education bureaucracies today, can be removed.

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ABSTRACTS
OF CONCURRENT SESSION PRESENTATIONS

Current Developments in Education in the Information Age

Plan for the Introduction of Informatics in Italian Senior High Schools (Bove, Aldo, Italian Ministry of Education, Rome, Italy)

The Italian Ministry of Education has prepared a national plan for the introduction of informatics in the curriculum of senior high schools. The plan is principally directed to the first two years of senior high school in order to lay the organizing and methodological foundations for its successful progress in the remaining three years. There are two initial goals of the plan. The first is to start the introduction of informatics with the purpose of providing a basic knowledge of informatics to the students of the first two years so that they will be able to continue in the remaining years with investigations which will give prominence to the cultural aspects of the problem. The second goal is to start a gradual use of the educational software with consideration given to the needs of the different types of schools. The most important aspects for the program's success is the training of teachers. Goals for teacher training are discussed.

The Nature of Inquiry and Developing a Profession (Case, Charles W., University of Iowa, Iowa City, Iowa, U.S.A.)

In order for education to evlove from a craft to a profession, a spirit of inquiry must be infused into the beliefs and activities of education faculty members and practicing teachers. This transformation can most likely begin in colleges of education in major research universities. Professionals live a life of inquiry regarding the whys and wherefores of their practice and seeking new knowledge to improve their practice. The responsibilities of teaching, research, and service are integrated activities of inquiry. If inquiry is to become a compelling force in the profession, and if the results of inquiry are to be valued, it will require the active participation of practitioners as well as researchers and university faculty members in a collegial relationship in the enterprise of research.

A Multi-Disciplined and Comprehensive Normal University in the Making (Dan-ran, Mao, East China Normal University, Shanghai, People's Republic of China)

The reform of teacher education is a key link in the chain of educational reform, since the quality of teacher education will directly exert influence on the quality of primary and secondary education. Since the founding of New China, the government has attached great importance to teacher education. Trends in the development of normal universities and teacher training programs in China are considered.

Twelve Year Survey of Media Availability in Public Schools in Washington State (Gebhardt, Richard F., Washington State University Pullman, Washington, U.S.A.) SP026772

A series of four questionnaires were mailed to schools in the state of Washington over a 12 year period to: (1) determine trends in media availablity; (2) attempt to establish data for projections of media availablity in the near future; and (3) consider geographic regions according to different availablity. The surveys included 76 items concerning hardware and software in addition to demographic information, and were sent to student teachers from Washington State University in 1971, 1976, 1981, and 1983. The scope of the surveys included all hardware from photographic copiers to television to fade/dissolve slide units to copy cameras. For the 1983 survey, computers were added in the survey items. Software items increasing in availability over the survey period included transparency materials and thermal spirit masters. Software decreasing in availability included diazo materials, dry mount materials, and filmstrips. Reasonably strong increases were seen in hardware, including xerographic copiers, cassette recorder/players, and overhead projectors. Decreasing availablity was seen for such hardware items as portable projection screens, reel type recorders, and primary and regular typewriters. Projections are made for future directions of software and hardware educational media.

The International Faculty Continuing Education Cooperative (Gooler, Dennis, Northern Illinois University, DeKalb, U.S.A.)

The International Faculty Continuing Education Cooperative was formed to provide more effective learning opportunities for teaching faculty from around the world who desire to work in or with certain American universities. Custom designed programs are provided to foreign participants through four types of services: individual leave programs, short-term educational programs, degree programs and teaching resources collection development. Members of the Cooperative are Arizona State University, Tempe, University of Hawaii at Manoa, Honolulu, Northern Illinois University, DeKalb, San Diego State University, California, and Syracuse University, New York. The secretariat is housed in the School of Education of Syracuse University.

Electronic Learning: Perspectives on Maintaining an Educational Relationship Through Electronic Communication (Keenen, Thomas P., The University of Calgary, Alberta, Canada) SP026773

Fifty gifted teenagers from across Canada, who were taught the Honeywell MULTICS "mail" and "forum" systems, were allowed free reign on an electronic communication system for several months. This paper reports on the students' use of the system, and on some of the interesting and unusual events which occurred during the course of the experiment. Among the conclusions discussed are:

(1) Electronic communication provided a valuble means for these gifted students to continue their interaction; (2) Several joint projects evolved showing the potential for working together at a distance; (3) Students enjoyed the experience; (4) Students developed a strong "brand loyalty" and resisted attempts to shift them over to other electronic communication systems; and (5) Students went to great lengths to maintain their electronic links, including buying computer equimpment and paying long distance charges. The author concludes that future investigations should examine students' use of research databases.

Critical Information Needs in Developing a Pre-Service Practicum Curriculum (Kooi, Sim Wong, Institute of Education, Singapore) SP026758

At the Institute of Education in Singapore, two disjunctions in teacher preparation were identified. The first was the realization of a gap between theoretical knowledge propounded in teacher education programs and the experience of students in the practicum. The second was the gap between both theoretical and experiental learning of the students and the real world of work undertaken by teachers in today's schools. A study of the work, "A New Basis for Teacher Education: The Practicum" (Turney, C. et al, 1985) provided recommendations vis-a-vis existing and future needs in teacher education. Thus, a new version of the practicum curriculum is emerging. In this process, there is also increased awareness of certain critical information needs. Therefore, concurrent with the evolution of a practicum curriculum, preparations for enhancing the development of an infrastructure for securing the vital information needed for the total system changes as implied by a practicum curriculum are underway. This paper presents an outline of the factors upon which the curriculum will be based.

The 8-4-4 Syustem of Education in Kenya (Lijembe, Joseph A., Ministry of Education, Science and Technology, Nairobi, Kenya)

The 8-4-4 educational system implemented in Kenya at the beginning of 1985 is described. This system has established 8 years of primary education, 4 years of secondary education, and 4 years of initial university degree study. It is believed that this system will respond more meaningfully to the challenges of national development in Kenya and the participation of the Kenyan youth in that development. Objectives for each of the levels of schooling are outlined, as is the broad based curriculum which will need to be implemented to achieve the goals.

New Responsibilities for Teacher Education in China's Reform of the Educational System (Bing Lin, Center for the Study of Higher Education, Beijing Normal University, People's Republic of China)

> The major elements of China's educational system reform are discussed, including the nine-year compulsory education plan, the reorganization of secondary education, and the innovation in educational thought and teaching methodology. In response to this nationwide reform, teacher education has to make greater efforts in promoting motivation for teaching, developing inservice training for teachers, training of vocational education teachers and redesigning teacher education curricula. Research in teacher education should be developed with the specific focus related to educational reform and the responsibility of teacher education in this context.

An Educational Plan for Three Country Model Building in the Southern African Countries of Botswana, Swaziland, and Lesotho (Myers, Allen, Ohio University, Athens, Ohio, U.S.A.)

> Contracts which the College of Education at Ohio University has developed with three southern African countries are described. The program designed for Botswana involves establishing a primary education department at the University of Botswana, with curriculum for training teacher trainers, inservice education for educational leaders, and a process for curriculum dissemination. A model for Swaziland has been designed for teacher trainers, providing assistance in curriculum development inservice teacher education, and workshops. The third project involves a partnership among six education agencies for strengthening teacher training programs, curriculum development, and other education areas.

The Use of Participatory Electronic Technology in Teaching Global Education Content (Roberts, Adrian R., North Carolina Central University, Durham, North Carolina, U.S.A.)

> The Anonymous Audience Response System (AARS), a form of participatory electronic technology, is an electronic feedback system which insures anonymity of individual participant's responses, and at the same time provides immediate feedback of a group's collective responses to questions under consideration. Evaluation questionnaires concerning the use of the system in teaching and problem solving about global topics and issues were distributed among participants. Analysis of the responses to the questionnaire indicated that local school level personnel are more favorable toward the AARS system that are central office personnel. The major advantages found with using AARS are: anonymity, removal of possible group pressure, immediate feedback, and increased speed and efficiency in voting. Major disadvantages

noted are: rushed voting and decision making, physical problems with set up, and lack of individual knowledge.

Computer Managed Instruction and Teacher Level Administration (Sall, Malkit S., The University of British Columbia, Vancouver, Canada) SP026927

The need for teacher level administrative tasks is identified. One solution offered is Computer Managed Instruction with a review of the literature and a model showing teacher, computer, and student interaction. A chart of important criteria for evaluating Computer Managed Instructional Systems is supplied. After synthesizing conclusions, some recommendatons are made along with future directions of Computer Managed Instruction.

An Evaluation Tool for a Teacher Educator (Shah, J. H., Gujarat University, Ahmedabad, India) SP026776

A report is given on an evaluation instrument designed for use by education majors in evaluating teacher educators. The insturment consists of five sub-parts: (1) rating scales for individual instructors; (2) 24 behavioral statements, evenly balanced between positive and negative; (3) statements on "good-bad qualities" of teachers as well as other staff members; (4) a five-point scale for assessing the effectiveness of dissertation guidance; and (5) selection of the two best and two worst teachers on the faculty. Copies of the instrument are appended. A brief discussion is presented on an analysis of the results of an evaluation of the Education faculty at Gujarat University, India.

Education in the Information Age: The Impact on Teacher Education and Teaching--A Perspective From the People's Republic of China, Tan Ren-Mei and Zhuang Ming-Shui, Institute of Educational Research, Fujian Teachers University, Fujian, People's Republic of China)

The extensive application of computers has created in human society an information revolution with computer technology as its developing core. The result of the revolution is that society has developed from an industrial one to an information society, opening up a new Information Age. Knowledge, information and intelligence appear to become the social strategical resources. Mankind no longer depends mainly upon physical labor to make a living but more and more upon knowledge, information and intelligence. The problems of teacher education in the Information Age are outlined and discussed, and recommendations for teacher education reform based on China's recent experience are given.

Instructional Media in Distance Education (Srisa-an, Wichit, Sukhothai Thammathirat Open University, Bangkok, Thailand)

In applying technology to distance education in the present day and age, the problem does not lie with a lack of media that can be used but rather with the selection of appropriate technology. While electronic media has advanced considerably and is being used increasingly in the field of education, print media still has a role to play which is no less important that that of electronic media. In distance teaching, print media will undoubtedly remain the core medium. Books and other printed texts have great advantages over electronic media--they are portable, need no power supply, contain very large amounts of information within a compact format, and lend themselves to random access treatment and to easy cross reference.

SECTION VI

Collaboration of Higher Education and the Private Sector in Development

Higher Education and the Private Sector: Principles of Collaboration

Chairman's Comments

Lloyd Barber
President, University of Regina
Saskatchewan, Canada

This plenary session has to do with the C. Y. Tung Annual Forum on the Interdependence of Business and Higher Education. In addition to my role as president of the University of Regina, I am also president of a new organization that is gathering steam in Canada called the Corporate Higher Education Forum. I will have a bit more to say about the Corporate Higher Education Forum in introducing this most interesting and important subject. I also find myself for one reason or another on the Board of Directors of a number of Canadian corporations. I will not mention their names for fear of being accused of running a commercial in this gathering. But by accident, I think, more than by design, I have had an opportunity to keep one foot in the corporate world and one foot in the academic world. Thus, my interest in the Corporate Higher Education Forum and the subject of this panel this morning.

At the risk of taking time from the other panelists, I think it will be useful for me to outline the genesis of the Corporate Higher Education Forum and give you some indication of this important thrust in academia and business in Canada. There is an organization in the United States called the Business Higher Education Forum. Some enterprising, young Canadians at Corcordia University in Montreal took a look at this and decided to try and replicate in Canada the success or growing success of the Business Higher Education Forum in the United States. Some of us got together and decided that this was an enterprise worth pursuing. We gathered together some 25 presidents of Canadian universities and 25 or 30 presidents or chief executive officers of Canadian business organizations to try to determine whether or not some formal, organized relationship between the two groups was timely and possible in Canada. We held an organizational meeting a few years ago in Montreal. It was agreed at that meeting that we should attempt to formalize an organization of this type to pursue the mutual goals of two major sectors in our society. The first order of business was to commission a study on the extent and nature of existing cooperation between universities and businesses in the country. About a year ago, we produced our first report, "Partnership for Growth," which is really a compendium of activities which are taking place, both successes and failures.

We have attempted to establish the kind of institutional framework that is required to bridge the culture gap between academic institutions and business organizations. Also, we have set out a plan of action for future activities of the forum.

We decided that, in order to augment our relatively modest resources, we should attempt to use those inherent in each institutional sector to put together task forces that would undertake the study of topics that were chosen at the annual meetings. At the recent annual meeting held in May, we had a report on research collaboration between the corporate sector and the university. This report was reproduced by one of the task forces, which was headed by the president of Bell Canada. That report will be published shortly. It is called "Working Smarter." It picks up the themes that were outlined in "Partnership for Growth," and suggests how those can be augmented in order to get more "bang for the research buck" in Canada. Another topic for which a task force was put together, is the question of the apparent dissatisfaction expressed by some business leaders with a quality of graduates which they have to hire, train and educate after the university is finished with them. This task force is headed by the president of the University of Toronto. One of the most vexing problems in this area is to decide what kind of education background should be given in the four-year programs that students enter in 1985 in order to equip them for a world where they must be fully productive or where they will be moving into positions of authority and responsibility five or ten years hence.

We hear a great deal about the problems that graduates have in becoming fully productive in the business sector. And so we have inaugurated a task force on human resource requirements in the future. We had a preliminary report at our May meeting, and I am not sure whether the people who were responsible for tackling that had any more success than anybody else who has tried to determine what kind of future activities individuals will be engaged in so that the education they receive now can be tailored to fit. I think it is an impossible task. I think that one of the things that discussions within the forum have demonstrated is that, increasingly, there is an understanding that the responsibility of postsecondary education is to educate, and that the business sector has to assume considerable responsibility for the training that takes place in order that individuals can be specifically competent within the specific organization in which they function.

The Corporate Higher Education Forum is a very exciting development in Canada; it is lending a new voice to discussions about the state of higher education. It is encouraging an increase in the degree of confidence among the funders of higher education that the corporate world is very interested in the state of academia. It is leading to enhanced relationships between academic institutions and major corporations in the country. It has the opportunity to influence significantly the evolution of public policy in education in Canada. The Forum is relatively new, but it has some very powerful business and academic voices associated with it. I look forward to its continued evolution. It is a very useful addition to our institutional mix, and a perfect example of the kind of thing that C. Y. Tung had in mind in his efforts to bring together the corporate and higher education sectors.

Higher Education and the Private Sector: Principles of Collaboration
Panelist's Comments

George Pedersson
G. A. Pedersson and Associates
Vancouver, British Columbia, Canada

I have never spoken to this kind of group before, and I feel a little bit like a fish out of water. I am a professional economist, and my job is forecasting the future. I feel a lot more comfortable doing that than standing here talking to you about the principles of collaboration between the private sector and the education sector.

The ideas I will be expressing have been forged initially while I was a student in the school system here in British Columbia and then in the university system. I have hired people coming out of the university system myself, and I have had to let some of them go because they could not make it. As a taxpayer who foots part of the bill for funding of universities and the education system, I believe that we in the business community have to put something back into the sytem. I fear for some of the things happening to the education system, and I would like to see that it does not suffer unduly because of the environment that we find ourselves in right now.

It goes without saying that things have changed dramatically in recent years. There are economic changes, and there are changes in the demands of the public due to changing expectations. These are presenting problems for the academic community. There is now a reevaluation within society (whether with respect to government, or private corporations, or schools) about their missions, what they are here to do, and how they are going to achieve their goals and objectives. The economy is becoming more interdependent. The academic community used to progress merrily along in a way really not affected materially by what was happening off campus. This is no longer the case. The world is smaller, and we are all being impacted by forces and events, many of which we cannot control. And we also have a situation where the focus of economic activity is shifting more toward the information society. The human capital that we develop through the education process is becoming much more valuable than technical or manual skills. The education system faces a very great challenge in making sure that we can adapt to this change in the environment as it relates to the information society.

Most businessmen and educators in the past did not recognize their mutual interdependence. We seemed to go our own ways. We were unwitting allies, never really calling on each other. Today, we must look at how we are interdependent and how we can help each other. We both have a lot at stake; we both have a lot to lose. We need each other. In its most fundamental way, the education system is analogous to the research facility of a large corporation. Whenever there are times that are tough, and people have to cut back quickly, it is the it is the research and development people who get the short end of the stick. This, without due regard given to the long-term consequences of such actions. The education system is the foundation of the long-term productive potential of the people who come through the system, and it ultimately affects the wealth-generating capability of society. We cannot afford, through misinformation or lack of communication between the private sector and the education system, to have inadequate, inefficient or wrong decisions made that will have long-term negative impact.

Why do we have this strong symbiotic relationship? The education system produces the labor force that will generate employment, jobs and wealth. Also, it is the starting point for a lot of the technology that becomes applied in the private sector. It also is instrumental in forming, changing or maintaining social values. Research that comes out of the academic community also has a great deal of influence on economic and social policy. As an economist, I have no doubt that if we had much better integration of the economic, academic and business communities, economic policy in Canada, and probably elsewhere, would be much better than that which we have seen in the last 15 years.

How does business function in this arena? Business provides the job opportunities, the places where people go after leaving the education system (with the exception of those who continue in the system and provide the valuable service of educating others). We indirectly provide the tax funding that supports the education system. We produce the innovative and application side of technology; the ideas very often germinate in the education system and they are then tested and utilized in the private sector. It is really critical that the long-term future of the business community depends very much on the quality of decisions being made about the nature, structure and content of education and about the kinds of research being done. We cannot afford to have incorrect decisions. The challenge is to find ways that the private sector and the education sector together can make the decisions so that they are the best possible for society. There has to be more interaction between the business community and the academic community.

One of the things that educators now must do is reevaluate who they are, where their strengths and weaknesses are, what their role is in society, and what their goals and objectives are. Once agreed upon, these should be communicated to those affected in government and business. It is only through communicating what your objectives are and explaining why you have those objectives that you are going to get any kind of understanding. There has also to be a commitment to follow through on those goals and the business community must be willing to listen. There is evidence that these things are happening. I am pleased to see that there are advisory bodies in educational institutions that include the private sector by having senior corporate people involved. The business community today, at least in the Vancouver area, is much more sympathetic to the needs and aspirations of the education community. The continuation of this kind of activity will create a much better environment.

We are in a turbulent time, and as in business, managing change strategically is a must. Whether we like it or not, we are going to be affected by many people who have influence over us. What we have to do is try to get those people to influence us in ways that are acceptable to us. We have to manage the change process. We have to become masters of our own destiny as much as possible, whether through politicians who are far sighted, by businessmen who understand your needs, or by a better informed and concerned public at large.

Summary of the C. Y. Tung Annual Forum on the Interdependence of Business and Higher Education

Francis Hamblin
President Emeritus
Loch Haven State University
Pennsylvania, U.S.A.

Yesterday, in Vancouver, at the small invitational C. Y. Tung Forum on the Interdependence of Business and Higher Education, which is held annually in various parts of the world, we heard presentations from one Korean and three Canadians (which does not indicate anything about how many Canadians it takes to match a Korean). During the discussion that followed these presentations, there were several conclusions tentatively arrived at, either actually or by implication.

The subject of cooperative education, which exists in a wide variety of forms and models, is now well accepted through most of the world and is increasing rapidly in its development. The two principle models were very well illustrated by the Korean and Canadian examples, the Korean one being concerned largely with graduate programs, and the Canadian largely in the undergraduate area, although each works in the other. It was firmly concluded that these should begin as close to the beginning student level as possible, rather than having this cooperation between business and higher education being parachuted in much later on at the research and development or graduate level.

Major problems were noted by several. Lacks in the educational program that were noted repeatedly were: too little emphasis on language skills; too little emphasis on getting along with people; too little leadership training subsequently leading to a vacuum in leadership at the corporate level; too little material on personnel manmagement; too little emphasis on marketing; far too little emphasis on international banking and finance. It was pointed out that the average academic year is comprised of about 25 weeks of instruction. Multiply that by 4 years, and you come out with 100 weeks. So the university is expected to do all of these things and more in a mere 100 weeks of instructional effort, something that seems manifestly impossible. Fixing blame is a popular exercise for columnists who can not think of what to write about for tomorrow's edition, but blame is of little value. We must find much more effective ways of doing what we are trying to do.

Another problem was protecting the investment of business in higher education, while at the same time, protecting the integrity of the institutions of higher education.

The final conclusion on this is that collaboration between the two sectors should be on a continuing, well-defined, long-range basis for the good of all, and that such collaboration is indispensible.

Finally, a few problems with our societies of a general and continuing nature were noted. In the recession which most of us are struggling with today, business has less discretionary money to give. At the same time, it was noted that education is relatively unversed in ways by which funds can be secured from the private sector to assist the educational institutions in their jobs.

Vastly more planning was one of the major stresses in all fields. Complicating the problem of planning is the explosive rate of change. One of our corporate representatives noted that in his particular business, the average employee would have to be retrained three or four times in the course of his professional career. He pleaded for an end to "ad-hocery;" we "ad-hoc" just about everything in place of planning.

The recurrently appearing adjectives yesterday were pragmatic, practical, planned, long-range, partnership, and so forth. We concluded that there are few if any final answers, and we have to continue planning and thinking, which reminds one of that stern but every timely admonition to "love those who seek the truth, but beware of those have found it."

Higher Education and the Private Sector: Principles of Collaboration
Panelist's Comments

Janet Ferguson
Special Policy Advisor
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Ottawa, Canada

The conference we are participating in today has three separate but related themes: the first is teacher education; the second is the enormous and complex question of "Education in the Information Age;" and the third is the specific theme of this session, which deals with how the private sector (which I shall refer to as "industry") can and should interact with universities in the business of higher education. I would like to comment briefly on each of these themes and to consider what role the federal government can play in these interactions. While these sectors touch each other in many ways, my specific concern is with their interaction in the area of research, as this is where the Federal Government is involved through its role in supporting research by way of the granting councils.

The Need for Collaboration

The need for all countries, not just Canada, to foster closer ties between educational institutions and the workplace has become increasingly evident in the past five to ten years. The reasons relate to a number of changes in society which are the result of what we have come to know as the "Information Age." This is an age characterized not just by sudden explosions in knowledge, but also by very rapid application of that knowledge in technology and then its appearance in the market place. It is an age in which all kinds of barriers between scientific disciplines, institutional and personal roles, and sectors are breaking down; an age in which jobs change almost overnight, and skills not imagined a decade ago are suddenly in strong demand. The neat boxes we have constructed to organize and give ourselves special identities are becoming uncomfortably restrictive.

Speed and adaptability are the keywords of the day. For industry, it is important to have fast access to the new technologies which improve productivity and generate new products. This means that industry must be involved in research at its origins in order to be alert to new developments at the leading edge of scientific endeavour.

For universities, the motivation for increased interaction with industry has been different, stemming initially from financing problems; from the need for expensive new equipment to support sophisticated research; and, in their role as part of the economic fabric of the nation, from the need to be sensitive to changing human resource demands.

Nowhere has the need for close working relationships between sectors been more evident than in the emerging field of biotechnology. In this field, the time between a conceptual breakthrough at the laboratory bench and the recognition of a commercial potential is exceptionally short. Studies have shown that patent applications in this field frequently cite papers published as little as three months before, whereas previously the movement of science to technology often was of the order of three to ten years. Recognizing that this element is a key factor in the international race to exploit biotechnology, the Government in 1983 announced a National Biotechnology Strategy to encourage the development of biotechnology in Canada. The fundamental philosophy of this strategy is that our ability to compete in biotechnology depends on an equal partnership of, and firm commitment from, all three sectors: industries, universities and government. No sector can do all that is required by itself. Biotechnology, with its extremely broad applications in the natural resource industries (forestry, fishing, mining, agriculture), in medicine, food processing, and commodity and specialty chemicals, to name but a few, is a field Canada would ignore at its peril. But we do not have the human or financial resources to develop all the technology we may need in this field. To compete internationally and to gain access to biotechnologies developed abroad, we need to have something to trade. We will need to harness the resources of all sectors to develop a strong world class expertise in a few key areas. And our success will require all the knowledge, experience and drive we can apply.

For this reason, many of the initiatives undertaken as part of the National Biotechnology Strategy are aimed specifically at encouraging communication and interaction between researchers and managers and between sectors. For example, the Strategy identified four broad areas of application as priorities for Canada. In each of these areas, research and development networks have been established whose purpose is to bring the performers of research and development (R&D) (scientists) into contact with the users of R&D (industries), to foster better understanding of the needs of other sectors, and to encourage members to undertake collaborative projects. These networks function in many ways. In general, they organize one formal meeting per year, and some sponsor specialized workshops and seminars as well. They act as an information source for industry people looking for research expertise, and for researchers wishing to identify industries with potential interests in their area of work.

In establishing the networks, it was hoped that these interactions would generate cooperative research projects and encourage industry to support specific projects in universities and, indeed, in some cases they have. To encourage this kind of cooperation, a cost-sharing programme was created under which Government shares the cost of an R&D project in industry provided that at least part of the work is subcontracted to a university laboratory. This programme, begun in 1983, now supports over forty cooperative projects.

Another strategy initiative was the establishment of a National Biotechnology Advisory Committee, with representatives from all three sectors, to advise the Minister of State for Science and Technology on the state of biotechnology, and to recommend policies to support its development. The Committee has held workshop meetings in several provinces, providing a forum within which the scattered biotechnology community can discuss issues of mutual concern.

Problems of Collaboration

There are many other elements in the strategy, but I think it is clear from what I have described that, in general, the Government supports and encourages closer interaction between university and industry, particularly in this and other areas of technology development. In many respects, biotechnology offers a case study in the pattern of technology development which is coming to dominate the Information Age.

However, as we all know, the road to cooperation is studded with potholes and rocks. We may all agree on the importance of closer links, but it must be recognized that higher education is a different activity from industrial production. It is different in mission, function and philosophy. In my view, the first and perhaps the only key principle of collaboration between universities and industry is that the fundamental differences between the two sectors must be recognized by both partners, and each partner must have an understanding of, and respect for, the different values and objectives of the other. Without this kind of mutual understanding and respect, efforts at cooperation may result in frustration, and may actually increase the separation between sectors.

An article appeared in Business and Society Review this spring, in which the following appears:

> Industry . . . exists to create goods or provide services for a profit. Products and services must compete successfully for a place in the market or disappear. The market plays the ultimate tune, a serenade for winners, a dirge for losers.

The article goes on to note that higher education exists to teach accumulated knowledge and skills, to perform basic and applied research with the intent that human knowledge be constantly expanded, and to offer services to society related to teaching and research. Universities do not operate at a profit. At best, they sometimes break even. Higher education must therefore be regarded as a public good requiring public finance. The quality of the product is hard to evaluate, and the importance of the research difficult to predict or assess. One great scientific experiment may be years in the making and its importance may take generations to be recognized. We must adopt a long-term perspective in assessing the quality of education.

Industry, on the other hand, cannot afford to ignore the short-term shifts in the market place. While long-term, strategic planning is important, industry's approach to research is governed by the view that research is a support mechanism for profitability.

Most of the specific obstacles to cooperation we have encountered are rooted in these fundamental differences in approach between the sectors. At the same time, as we encourage collaboration, we must guard against the temptation to see universities primarily as a support facility for industry, and to judge their performance by the industrial standards of short-term results and profitability. We must also guard against the temptation to expect industry to assume a major role in supporting long-term, curiosity-motivated research. While some very large firms can participate in this activity, small and medium sized firms, Canada's mainstay, cannot afford to do so.

Fostering Closer Links

We face a situation in which the economic health of many nations depends on close cooperation between two fundamentally different kinds of institutions: universities and firms. The urgency of this need is largely the result of the knowledge explosion which has been taking place during the past decade.

Here perhaps is our link to the issues of education in the Information Age. The new technologies do not understand boundaries; in biotechnology, engineers must understand microorganisms and biologists must deal with physical and engineering principles and complex chemical reactions. Computers are a key tool both in research and production. Successful biotechnology requires the application of principles from many sciences and from business for the solution of problems. In general, teams of scientists and business people must work together to provide the necessary pieces of information and expertise. Like a jigsaw puzzle, each piece has its own special shape, but to complete the picture, it must interlock smoothly with others.

It was noted yesterday that, in general, our educational programmes are not structured in this way. Beginning in elementary school from a broad general base, students become increasingly separated into different streams, and they are focussed on more and more specialized and narrow areas as they progress towards and through graduate school. A major challenge to education in the Information Age is to create bridges between specialists so that they can work together better. At the same time, we do not want to sacrifice the important in-depth research and thinking required to develop real expertise in any field.

The development of the cross-sectoral links we have been discussing are also a concern for educators. The Science Council of Canada recently published a report documenting in some detail the state of science education in Canadian elementary and secondary schools. A major finding of the study was that our teachers, textbooks and science curricula focus almost entirely on teaching so called "pure" science to students. There is very little attention to technology, or to its relationship to science, and one might conclude from an examination of the materials used that science stops at the laboratory door. Indeed, students appear to have some difficulty relating the science they are taught in school to the science and technology they encounter on the street, on television, and in the newspapers. Most important for our purposes, they learn almost nothing about the industrial uses of science and technology.

A survey of over 4,000 science teachers revealed that while secondary teachers tend to be well qualified with university science courses, very few have had any experience working in industry. In fact, very few have any training in applied science or engineering. While the Science Council study looked at elementary and secondary school teachers, I would hazard a guess that the situation in most university departments of science, excluding engineering and applied science, is similar. The typical path to a career in education is straight through university and graduate school and back to the classroom. In this competitive age, few can afford to deviate far from that path.

On the industry side, it would be interesting to know how many industrial researchers and managers have experienced the education system from the teacher's or professor's perspective. Since we have all experienced school from the student's perspective we tend to assume that each of us knows quite a lot about education. But the aims, responsibilities and motivations of teachers are as different from those of the student as are those of the producer from the product. How well do business executives and researchers really understand the problems and constraints with which educators work?

If collaboration between higher education and the private sector depends on mutual understanding and respect for the differences in motivation and values between the two sectors, then we need to look at a major shift in our approach to teaching at all levels. The curriculum must incorporate a view of the uses of science in industry and convey a sense of how production, productivity, science and technology are related. This can only be achieved if the people doing the teaching have opportunities to develop this understanding on a personal basis. On a policy level, we should encourage personnel exchanges between schools, universities and industry. To use an old adage, there really is no substitute for experience. I would like to mention the cooperative education programmes as an important initiative in this direction.

There are many other ways in which the Information Age affects education, and these are bound up with some of the other changes which are happening at the same time. Declining school enrollments combined with rapidly changing job requirements make us ask whether the focus of education in coming years should not shift, at least a little, to older age groups. Age barriers are starting to fall as well in this era.

Governments can play a supportive and catalytic role in helping to build bridges. The initiatives mentioned as part of the biotechnology strategy are examples of the kinds of efforts that can be made in this direction. In addition, under the recently signed British Columbia-Canada agreement on economic and regional development, the

Federal and Provincial Governments are cooperating to establish industrial liaison offices at the universities in British Columbia.

Conclusion

While the principle of mutual understanding and respect for differences that I have put forward here may seem simplistic, the least impressive goals (less impressive perhaps than buildings or centres of excellence) are often the most difficult to achieve. We must remember that cooperation is a "people process." Buildings do not cooperate. To twist another old phrase, information is in the ear of the receiver, and making sure that the receiving ears can interpret the information they are sent is the major communication challenge of this era. We have all kinds of technology to move information across continents, and even between sectors. What we need now, and what educators can help to provide, are the ears and minds that have the understanding to receive and use this information.

ABSTRACTS
OF CONCURRENT SESSION PRESENTATIONS

Collaboration of Higher Education
and the Private Sector

Corporate and Higher Education Collaboration to Improve Teaching: A Case Study (Bloom, Darrell, National College of Education, Evanston, Illinois, U.S.A., and Pam Koenig, Amoco Foundation, Chicago, Illinois, U.S.A.) SP026760

This paper explores an innovative approach to funding school improvement programs. It looks at a series of programs initiated by the National College of Education in collaboration with several corporations and foundations in the Chicago metropolitan area. The evolution of the College's participation in these endeavors is reported as well as the strategies used to solicit corporate, institutional, and public school support. Collaborative endeavors are discussed from two perspectives. First, the institution of higher education is examined and it is noted that the involvement of key academic administrators, faculty, and development office personnel is crucial to the success of these projects. The second perspective examined is that of the corporation providing technical assistance and financial support. Important considerations that face corporations before becoming involved in collaborative projects with institutions of higher education are discussed.

American Business Language Education via Telecommunications (DeStefano, Johanna S., Sheila Crowell, and Ellen Kolba, The Ohio State University, Columbus, U.S.A.)

American Business Language Education (ABLE) is the product of cooperation between universities and companies in the private sector. It is designed primarily for use in business and industry training environments, and it makes use of telecommunications technology for distance teaching. The theoretical background, program characteristics, and a demonstration including a sample lesson are included.

A Collaborative Model for Continuing Learning in Computers for Professional Educators (Duszynski, Timothy J., Marycrest College, Davenport, Iowa, U.S.A.) SP026762

A description is given of a collaborative model for continuing education in computers for professional educators. The National Computer Training Institute, a private consortium founded in 1984, has as its goal the development and delivery of high quality training materials and activities for teachers, students, and community members. Eighty-six computer learning centers have been established to date. The implications of this collaborative model include: (1) it serves as a model for other emerging fields of import to professional educators; (2) it provides state-of-the-art instruction delivered to professional educators in ways that are cost-effective and convenient to the educator and the provider; and (3) it helps to defuse criticism in some sectors that schools of education cannot keep pace with the rising costs of instruction in emerging technologies--the model cost less than if similar instruction were delivered exclusively by the college.

Building Bridges Between Public Schools, Industry and Higher Education: Collaboration in Mathematics and Science (Huffman, Gail M., and others, University of North Carolina-Charlotte, North Carolina, U.S.A.)

> Collaborative projects developed between business and industry, public schools, community agencies and institutions of higher education can provide benefits for all participants. This presentation describes the establishment of a cooperative program between the University of North Carolina-Charlotte, the 15 school districts in the Southwest Region of North Carolina, business and industries, and community agencies such as local museums, to promote interest in mathematics and science education. A computerized resource bank of "talented presenters" from the groups mentioned above was developed. It identifies people who are available to visit regional classrooms to demonstrate a principle or concept related to mathematics, science and technology, thereby generating interest and illustrating the practical use of science, mathematics and technology. The Talented Presenters Resource Bank is being compiled for access and use by the regional public and non-public schools and serves approximately 10,000 teachers in the Region. Principles which gird effective collaboration and specifics of the program, such as participation agencies, range of topics, and procedures are included.

An Evaluation of a Private Sector Initiative to Support Public Education (Kimball, Roland B., University of New Hampshire, Durham, New Hampshire, U.S.A.) SP026764

> A description is given of a Summer Critical Skills Institute program developed under the aegis of a number of private corporations in conjunction with several educational agencies. This program provides opportunities for teachers to learn how to foster students' problem solving abilities. The teachers, working directly with young learners and supervised by master teachers, are introduced to an approach called "Learning by Real Problems." Learners are confronted with problems of complexity sufficient to demand high order thinking skills, yet realistic in terms of the situation and the maturity of the learners. Because this learning model functions within the work setting of the sponsoring corporations, it represents an approach to school learning that the corporations are ready to support.

Integrated Symposium on Education in the Information Age (Krebs, Arlene, and James H. Finkelstein, New York University, New York City, U.S.A.)

> The interests of higher education and the electronics industry appear to be converging, supported by the merger of computer and communications technology. Interactive instructional technology and telecommunications technology are vital forces capable of

enhancing educational productivity in various ways. These technologies, in the absence of cogent instructional and curricular planning and development, represent solutions looking for a problem. Higher education must develop greater awareness of the capabilities of such technology, and aid business and industry in developing appropriate applications. This symposium draws upon experiences at a major urban university, and deals with applications of interactive videodisc technology, approaches to teaching technology assessment, and collaboration between higher education and the private sector.

The Collaboration Between Higher Education Institutions and the Private Sector: A Case Study of Thailand (Sinlarat, Paitoon, Chulalongkorn University, Bangkok, Thailand) SP026765

Thailand's higher education institutions, once largely involved with the education and training of civil servants, have recently begun to seek collaboration with private sector institutions. This activity began when it was found that there was a limited number of governmental positions available, and increasing numbers of graduates needed to seek jobs in the private sector. Efforts at collaboration have had some problems due to the "ivory tower" concept, and because of the academic standards of university faculty members. However, many creative efforts to bring about innovative programs for cooperation among business, industry, and higher education have been successful. Activities have included: an educational development unit; a continuing education center; a specialized training center; an academic service center; and an academic network. The major difficulty in the collaborative efforts has been the differing objectives, expectations, and orientations of personnel from the university and from the private sector institutions. The author concludes that an exchange system, with educators taking part in private sector activities and with private sector personnel taking part in educational activities, will help to close the gap between the two areas.

New Horizons in Education Preparation Programs Through Greater Partnerships with Business and Industry (Smith, George N. and Marcy P. Theede, Northern Arizona University, Flagstaff, Arizona, U.S.A.) SP026766

A study was conducted at the Northern Arizona University to determine the necessary steps to improve the school's education programs. The basic conclusions of the study were: (1) Abolish the College of Education and replace it with the Center for Excellence in Education to facilitate interaction between the total university faculty, business and industry; (2) Implement the concept of a team leadership matrix whereby faculty expertise and community resources effectively contribute to the development and implementation of high quality educational programs and services; (3) Conduct a comprehensive review, overhaul and update of the curriculum and requirements for all educational programs; (4) Develop and implement a faculty development and leadership program, including an accountable faculty evaluation system; (5) Identify major forces affecting society and what modifications are necessary for our educational system to keep pace; and (6) Organize university, state, and national Advisory Councils to systematically work with the Center to implement educational reform and improvement processes. The radical change to a team leadership matrix was designed to decentralize educational preparation programs and develop a working relationship with public schools, business, and industry. The nucleus of the "partnerships" approach is the statewide advisory council supplemented by a network of field centers. These centers will function like an agricultural extension service in providing quality educational programs and services to rural, remote and unserved areas.

Partner Project: A Collaborative Program of Business, University and Public Schools (Wamacks, Naomi, Arizona State University, Tempe, U.S.A.)

The Partner Project is a collaborative effort of the College of Education, a number of local industries, and six school districts to prepare liberal arts graduates in mathematics and science to become certified to teach. This case study describes the events leading to the initiation of the Partner Project and its major characteristics.

The Bush Foundation and the University of South Dakota: A Case Study of Public and Private Sector Collaboration in Faculty Development (Wood, Robert W., The University of South Dakota, Vermillion, South Dakota, U.S.A.) SP026767

The Bush Foundation Program at the University of South Dakota supports faculty development activities which have as their goal the improvement of undergraduate learning. The program is designed to address the university's special concerns with respect to faculty development including the diversity of its mission, its small size, and the remote location of its campus. Any faculty member of the university directly involved in undergraduate teaching is eligible to participate by presenting a proposal for faculty development in one of four categories: educational experiences, research activities, curriculum improvement activities, and symposia. The program provides mini-grants to individual faculty members, symposia featuring visiting scholars, and release time for curricular revisions. A description is offered of the university's three-year collaboration with the Bush Foundation, and examples are given of the types of activities with which faculty members have been involved. The paper also describes steps in preparing the original proposal, administration and operation of the program, and evaluation procedures and results.

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